BEVERAGE & FOOD WORLD

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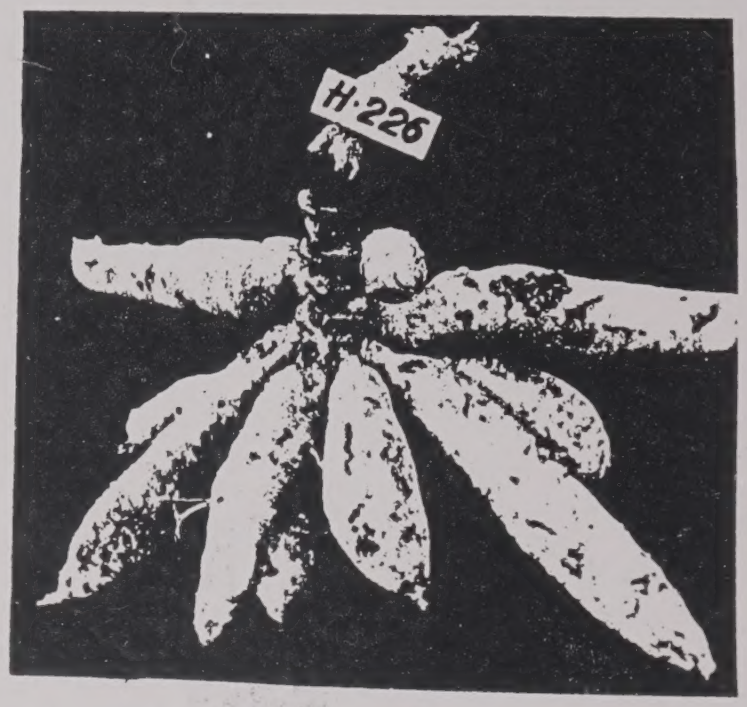

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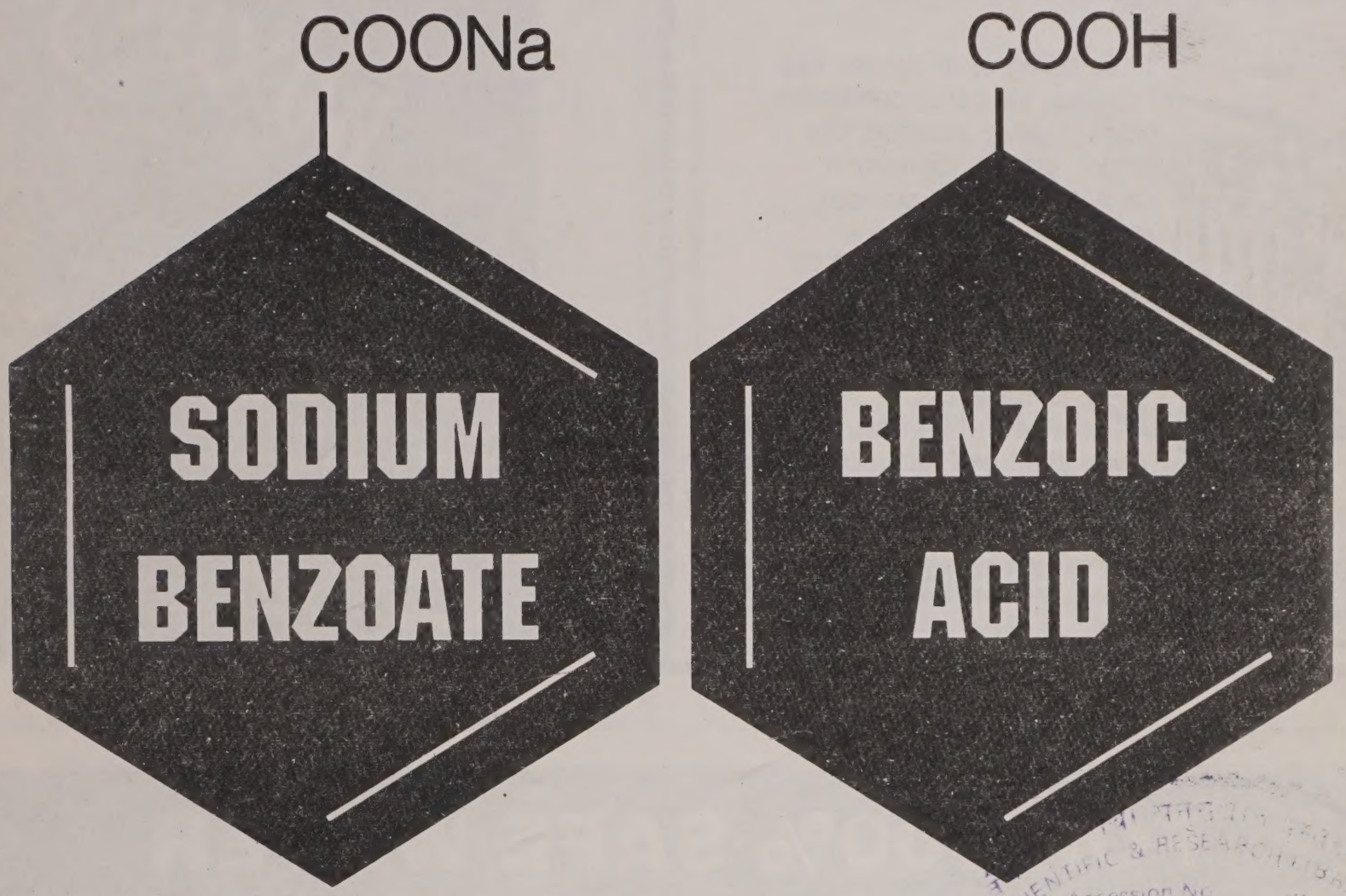

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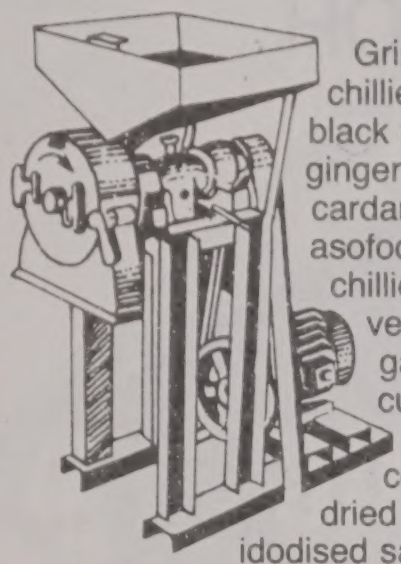

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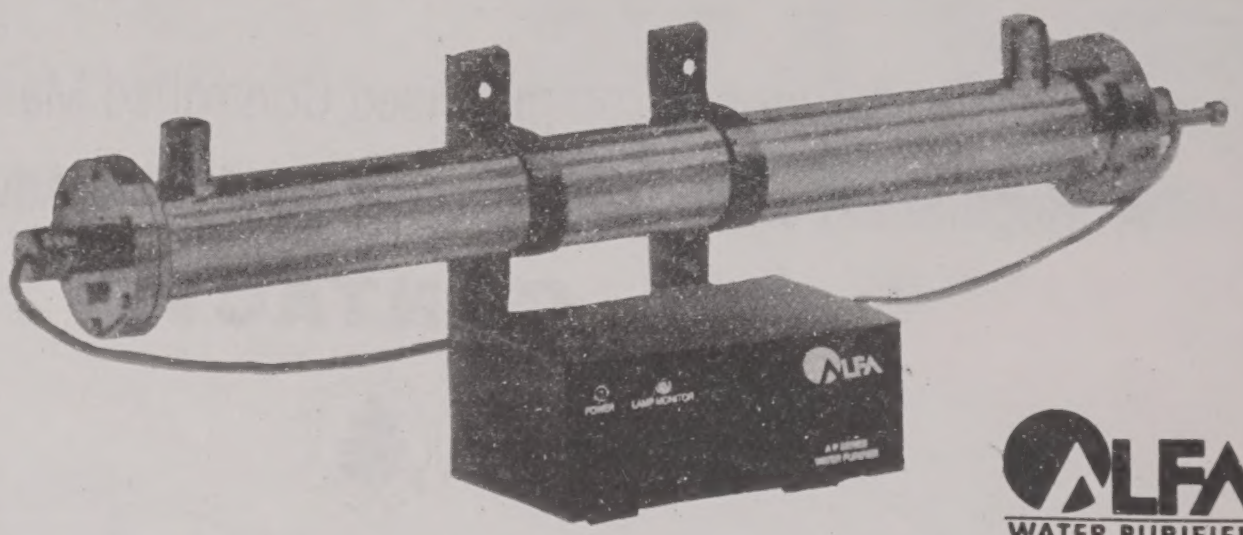

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FOOD ADDITIVES - THE ESSENTIAL INGREDIENT

Food additives have been used since ancient times to preserve foods and make them more attractive. These are natural or synthetic substances. ey are used in industrial food processing, from basic products such as frozen vegetables used in the preparation of ready-cooked meals, semi-finished products, colourings and sweeteners. Food ingredients are playing an increasingly important role today in the development new products and the quality of food products.

Food Additives are broadly classified as under: a) Preservatives b) Colours c) Flavours d) Texture Agents, and e) Miscellaneous group.

***Preservatives** as the name suggests are used to a) preserve the nutritional quality of food b) enhance keeping quality or improve organoleptic roperties, and c) provide a processing aid. These can be classified into 2 categories: Class I which includes common salt, sugar, spices, oney, vinegar, acetic acid, etc. and Class II which include benzoic acid and its salts, sulphurous acid and its salts, nicin, sodium and calcium roprionate, etc.*

***Colours** which make the product attractive, are either natural food colours, or permitted synthetic food colours. In natural food colours, variety can be found in different types of fruit, vegetables and other raw foods. Synthetic food colours are chemically synthesised compounds. hese have to be certified or approved by the FDA.*

***Flavours** are generally classified as natural, nature identical or synthetic. Loss of flavour is a constant problem for products with an tended shelf life as well as through the processing cycle. The main method for achieving extended shelf life of flavours has been the use f antioxidants or preservatives. Another method is flavour encapsulation which encases flavour oils in a natural carbodydrate, ideal for owdered beverage, dry mix cakes and biscuits, meat and savoury gravy mixes and dairy products like salad dressings.*

***Texture agents** : These are basically emulsifiers, stabilizers and thickening agents such as agar, lecithin, sodium alginate, glyceryl onosterate, propylene glycol, etc.*

Maltodextrins are used as bulking agents in icecreams. Dextrose impart smoothness and resistance to premature drying, for icings, creams, ondants and other fillings - as well as make sherbets and fondants more attractive and so on.

***The Miscelleneous group** covers a large group of additives serving many functions, such as hardening, drying, leavening, antifoaming, risping, antisticking, whipping, creaming, clarifying, sterilizing, bleaching and maturing, sweetening, nutritional supplementing, etc.*

Glucose syrups, a vital ingredient in confectionery are used to control crystallisation, rheology, hygroscopicity, colour development, weetness and much more. Polyols such as sorbitol, maltitol mannitol, etc. act as non-cariogenic sweeteners for sugar-free confectionery. orbitol is an ideal sugar subsititute for diabetic specialities. Caramels provide a range of colourations from red-brown to dark brown and lso flavour enhancement. Vital gluten is the protein element of wheat, and is an extremely versatile bakery ingredient with a unique combination f binding, water absorbtion and visco elastic properties which leads to its use in many baked products. Modified starches are used in the anufacture of gums and jellies as well as vegetable oil-based moulding starches, special starches which can replace gum arabic and freeze-haw stable starches for use in chilled and frozen products.

Since time immemorial, spices have played a vital role in world trade, and in the past ten years, the international trade in spices has rowth 4% per annum in volume and 15% in value. An estimated 500,000 tonnes of spices and herbs valued at 1500 million US Dollars re now imported globally every year. An impressive one-fourth of this supply comes from India. Indian spices have traditionally been of much superior quality, thanks to the rich fertile soil, congenial climate and the use of very little chemical fertilisers and pesticides.

Essential oils are volatile constituents present in herbs or spices, removed by means of steam distillation and marketed in the form of highly concentrated aromatic liquids known as ''essential oils'' or as diluted products known as "essences". In some cases, for example, epper, ginger and chillies, aromatic material is extracted from spices by means of suitable solvents which are removed by evaporation. This thick oily residue is called ''oleoresins''. Therefore, characteristic flavour of spices (except for pungency) are found in essential oils, while if pungency is desired, this is found in oleoresins. High Fructose Corn Syrup, a concentrated solution containing fructose and dextrose with lesser quantities of higher molecular weight saccharide, is a relatively new product in the Indian market, presently used mainly in the biscuit and soft drink industry. It has wider applications abroad such as in canning, confectionery, dairy, and other areas of bakery and beverages.

Interest in health is forecast to remain one of the most important trends in 1994. For 1994 the indication is that food consumption patterns will continue to change. The key stages are as follows :

-Increasing knowledge of health and its relationship to the diet are likely to lead to a further increase of, for example, low calorie products, an increase in vegetarianism and an increased interest in organically-grown products;

-Increasing knowledge and affluence will raise the demand for quality and freshness;

-Convenience and snack foods emerge as areas of immense growth, spurred on by busier lifestyles;

-Food and beverages begin to reflect certain lifestyles and fashions.

Overall, health and environmental issues look set to continue to be prominent whilst there continues to be improved levels of education and awareness of foods and their health implications and a return to "au naturel". Consumers' passion for healthy eating extends from low-calorie and low-cholesterol products more into the area of functional foods and food fortification, however.

Functional food ingredients such as fibres, oleosaccharides, and lactic acid bacteria, are expected to attract even more attention in 1994. In the area of food fortification, the use of calcium and other minerals as well as the addition of vitamins to a wide range of products, are expected to lead activity.

With regard to the relationship between ingredient supplier and the food manufacturer, the concept of business partnership is forecast to grow rapidly. Ingredient companies increasingly acquire the expertise and pilot plant facilities which enable them to produce examples of the finished product in a fairly advanced form, then introduce working with their 'food manufacturing' partners to finalise the product and introduce it to the marketplace.

Food Preservation by Combined Methods

by

L. Leistner
Institute for Microbiology, Toxicology and Histology
of the Federal Centre for Meat Research, Germany

Water Activity and Food Preservation

As is well known, the stability and safety of food does improve if the water activity (a_w) of the products decreases. Common methods for decreasing the a_w of foods are drying, addition of salt, sugar or polyols, and freezing. The a_w of foods influences the multiplication, metabolic activity, resistance and survival of the organisms present (Leistner et. al., 1981).

If we want to intelligently influence the a_w of foods, we have to know it. The $_w$ of foods may be calculated by employing equations (Chirife et. al., 1980 or it is measured using suitable instruments. Several reliable instruments are today available, which measure a_w by applying different principles. We devised several years ago a simple hair hydrometer made by Lufft (Stuttgart, Germany) which is reasonably priced and works quite well, if handled with care (Rodel et.al., 1975). Widely used are electric hygrometers made by Novasina or Rotronic (both Zurich, Switzerland), for measuring the a_w of foods (Rodel et. al., 1979), these are more precise, but also more expensive. Recently our laboratory has introduced a new instrument for the accurate and quick measurement of a_w in meats, which is based on the determination of the freezing point (Rodel et. al., 1989). It is remarkable, that with this instrument made by Nagy (Filderstadt, Germany) an a_w measurement is done in about 15 min, and the same instrument can be employed for determining temperature, relative humidity, pH and redox potential, of course, by using different sensors. Such multipurpose instruments are appropriate for quality assurance in food processing.

The stability and safety of many foods is not based solely on a_w, but on the combined effects of several factors. Therefore, the a_w of foods should always be viewed in relation to other inherent factors, and this is the topic of this paper. The mode of action of the combined factors used in food preservation should be studied, since they could have an additive or even synergistic effect.

Hurdle Effect and Food Stability

The hurdle effect is an illustration of the fact that in most foods several factors (hurdles)) contribute to stability and safety. This hurdle effect is of fundamental importance for the preservation of food, since the hurdles in a stable product control microbial spoilage and food poisoning as well as the desirable fermentation.

There are many processes used for making foods stable and safe, e.g. heating, chilling, freezing, freeze drying, drying, curing, salting, sugar addition, acidification, fermentation, smoking or oxygen removal. However, these many processes are based on relatively few parameters or hurdles, i.e. high temperature (F value), low temperature (t value), a_w, pH, redox potential (Eh) preservatives, and competitive flora. In some of the preservation methods mentioned, these parameters are of major importance, in others they are only secondary hurdles (Leistner et.al., 1981).

We introduced the hurdle effect some years ago (Leistner, 1987), and it has since been modified and extended several times (Leistner, 1986a, 1987). The present concept is shown in Fig. 1, which gives eight examples. Example 1 illustrates the principle and represents a food which contains six hurdles (i.e. F, a_w, pH, E_h, and preservatives). The microorganisms present cannot overcome ('overjump') these hurdles, thus the food is microbiologically stable and safe. However, Example 1 is only a theoretical case, because all hurdles are of the same height, i.e. have the same intensity. A more likely situation is presented in Example 2. since the microbial stability of this product is based on hurdles of different intensity. In this product the main hurdles are the a_w and preservatives, while other less important hurdles are storage temperature, pH and redox potential. These five hurdles are sufficient to inhibit the usual types and numbers of organisms associated with such a product. If there are only a few microorganisms present at the start (Example 3), then a few or low hurdles are sufficient for the stability of the product. The aseptic packaging of perishable foods is based on this principle. On the other hand, as in Example 4, if due to bad hygienic conditions too many undesirable organisms are initially present, even the usual hurdles inherent in a product cannot prevent spoilage or food poisoning.

Examples 5 is a food superior in nutrients and vitamins, which foster the growth of microorganisms ('trampoline effect'), and thus the hurdles in such products must be enhanced, otherwise they will be overcome. Example 6 illustrates the behavior of sublethally damaged organisms in foods. if, for instance, bacterial spores in meat products are damaged sublethally by heat (as occurs in F-SSP, discussed later), then the vegetative cells derived from such spores lack vitality, and therefore are already inhibited by fewer or lower hurdles. In some foods, such as fermented sausages and raw hams, the microbial stability is achieved during processing by a sequence of hurdles. Example 7 illustrates the sequence of hurdles in fermented sausages, as will be discussed later.

Finally, Example 8 should illustrate an important phenomenon, which deserves particular attention in foods preserved by combined methods, because different hurdles in a food might not just have an additive effect on stability, but could act synergistically. A synergistic effect of hurdles is to be expected if the different factors (e.g. a_w, E_h preservative) have different targets within the microbial cell, and thus disturb the homoeostasis in several respects. This could make it difficult for spoilage or food poisoning organisms to overcome the lag-phase, and if multiplication is delayed the microorganisms eventually die. Therefore, employing different hurdles in the preservation of a particular food should be advantageous, because already with gentle hurdles microbial stability could be achieved. Certainly, the relationship between food preservation and the homeostasis of microorganisms deserves attention.

As Fig. 1 indicates, in fermented sausages we can distinguish five different hurdles which become active and fade out in a sequence (Leistner, 1985, 1986b). These hurdles effectively inhibit food poisoning organisms (Salmonella ssp., Listeria monocytogenes, Staphylococcus aureus, Clostridium botulinum) as well as other bacteria which might cause spoilage. On the other hand, this se-

ence of hurdles favours the selection of the sired competitive flora (especially lactic d bacteria), which contribute to the quality the products. An important hurdle in the ly stage of the ripening process of salami nitrite, added with curing salt, because rite inhibits the growth of salmonellae. trite also inhibits some additional bacteria, ile others can grow and due to the multi- cation of these bacteria the redox potential the product decreases, and this is turn hances the E_h hurdle, which inhibits aero- organisms and favours the selection of competitive flora, primarily lactic acid teria. Their growth and metabolic activity use acidification of the product and thus an crease of the pH hurdle. This is of particular portance for the microbial stability of quick pened fermented sausages, which are not operly dried. The hurdles of nitrite, E_h, mpetitive flora and pH diminish with time, cause in ripened salami the nitrite level and e count of lactic acid bacteria disease, while e E_h and pH increase again. Only the a_w is engthened with time, and this hurdle is ainly responsible for the stability of long pened fermented sausages. Certainly, also the processing and storage of some other ods, e.g. cheese, a sequence of hurdles is sponsible for microbial stability, and it ould be challenging to investigate this phe- omenon in various foods.

With fermented sausages we can differ- ntiate in Germany two groups; i.e. quick pened products and slow ripened products. uick ripened products amount to about 80% f the production and the slow ripened prod- cts to only 20%. In quick ripened products e a_w is rather high, because they still con- in much water, and therefore are less ex- ensive. However, to compensate for this igh a_w a low pH in such products is neces- ary for microbial stability. On the other and, slow ripened products, which are more xpensive due to the long drying period, have low a_w, and therefore these products can fford a rather high pH which makes them nuch more tasty. I mention these difference etween quick and slow ripened salami, be- ause they illustrate that the hurdles in a food re somehow interchangeable. Emphasis ould be given to different hurdles to achieve tability, with the consequence that the prod- cts have different features related to their ensory properties and price.

Hurdle Technology and Food Design

From the hurdle effect, the hurdle tech- ology has been derived (Leistner, 1985, 1986a), since an intelligent combination of urdles secures the microbial stability as well as the sensory nutritive, toxicological nd economic properties of a food. The prac- ical importance of hurdle technology for stable and safe foods has now been recog- nized by the food industry. In food design as well as food control this principle is increas- ingly applied and has proved very success- ful.

Even the pet food industry has made novel and attractive products by applying hurdle technology. A stable pet food was formerly produced with an a_w of 0.85 and this needed addition of much propylene glycol which might have caused health implications in cats. But now based on hurdle technology pet foods are stable with an a_w of 0.94, and they are more healthy, tasty, and economic.

Hurdle technology is now widely used especially in food design, for making new products according to needs. For instance, if energy preservation is the goal, then energy consuming hurdles such as refrigeration are replaced by hurdles (a_w, pH or E_w) which don't demand energy and still ensure a stable and safe food (Leistner, 1987). Furthermore, if we want to reduce or replace preservatives, such as nitrite in meats, we could emphasize the other hurdles in a food, e.g. a_w, pH, refrigeration, or competitive flora, which would stabilize the products (Leistner et.al., 1980).

Food control could be based on the physi- cal and chemical measurement of hurdles in a food and computer evaluation of the results. This approach could give faster and some- times more reliable information on the stabil- ity and safety of foods than a microbiological investigation. Hurdle technology used for food control may be regarded as a precursor microbiology.

Hurdle technology is by no means a new process, as has been pointed out by Chirife et.al. (1991) in their study on mummification in ancient Egypt. In the opinion of these authors the embalmed mummies contained (at least) three hurdles, namely reduced a_w (0.72), increased pH (10.6) and preservatives (spices, aromatic plants). Therefore, the ap- plication off combined methods used for preservation has indeed a long history.

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The term SPP was introduced by our labo- ratories (Leistner & Rodel, 1979) for high moisture meats ($a_w > 0.90$), which may be stored for weeks or months without refriger- ation, in spite of a mild heat treatment. We predicted (Leistner **et al.**, 1979) that SSP would gain importance. Fox & Loncin (1982) emphasized that in heated foods which con-

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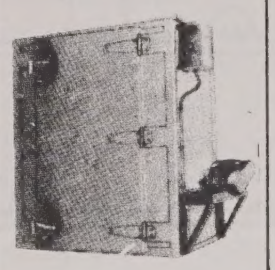

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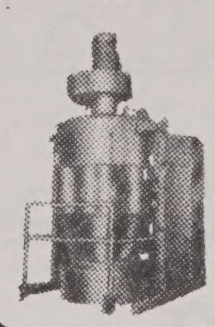

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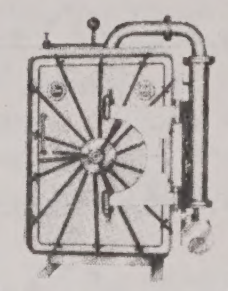

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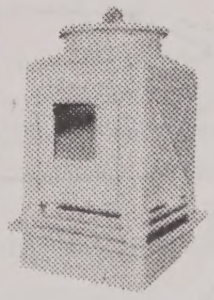

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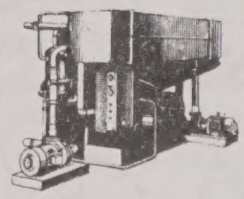

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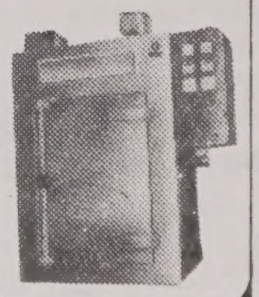

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tain only viable spores of bacilli and clostridia the microbial stability could be more easily achieved by certain hurdles, than in products where a large range of microorganisms is present.

Stability without refrigeration is an important feature for foods in developing as well as industrialized countries. In developing countries refrigeration is not readily available and in industrialized countries foods which need no refrigeration save costs by saving energy during distribution and storage. Furthermore, mild heat treatment (70-110°C core temperature) is beneficial, because it fosters the sensory and nutritional properties of the products. However, the heat process must be sufficient to inactivate all but sporulated bacteria. Since the containers are sealed, a recontamination of foods after heating is avoided. SSP still contain viable spores of bacteria, but the growth of surviving bacilli and clostridia is inhibited by a sufficient decrease of a_w, pH, and E_h. A low redox potential favours clostridia, on the other hand some bacilli are more a_w - tolerant than clostridia but can be inhibited by a low E_h. Therefore a low redox potential overall contributes to the microbial stability of SSP meats (Leistner et.al., 1980). For industrialized countries production of SSP is more attractive than intermediate moisture foods, because of the required a_w for SSP is not as low, and thus less humectants and/or less drying of the products are necessary.

Depending on the hurdles which are most important for the stability of a particular product group, we distinguish today between F-SSP, a_w-SSP, pH-SSp and Combi-SSP; minor hurdles are also active in these products. The primary reason for stability of F-SSP is the inactivation of sublethal damage of bacterial spores, for a_w, the reduction of a_w, for pH-SSP an increased acidity, and in combi-SSP several hurdles are balanced out. Traditional SSP meats (both a_w-SSP and pH-SSP) have been on the market for many years, the F-SSP were introduced about 10 years ago, and Combi-SSP are still under development Hitherto the SPP concept has been mainly applied for meat products, however, certainly it could be useful for other foods too.

SSP are quite sophisticated products, which need reliable control of important critical points during manufacture, therefore, their processes are best defined using the HACCP concept. During processing the temperature and time as well as pH and a_w should be strictly controlled, a microbiological investigation of the products based on suggested guidelines would provide additional information (Hechlmann et.al., 1991).

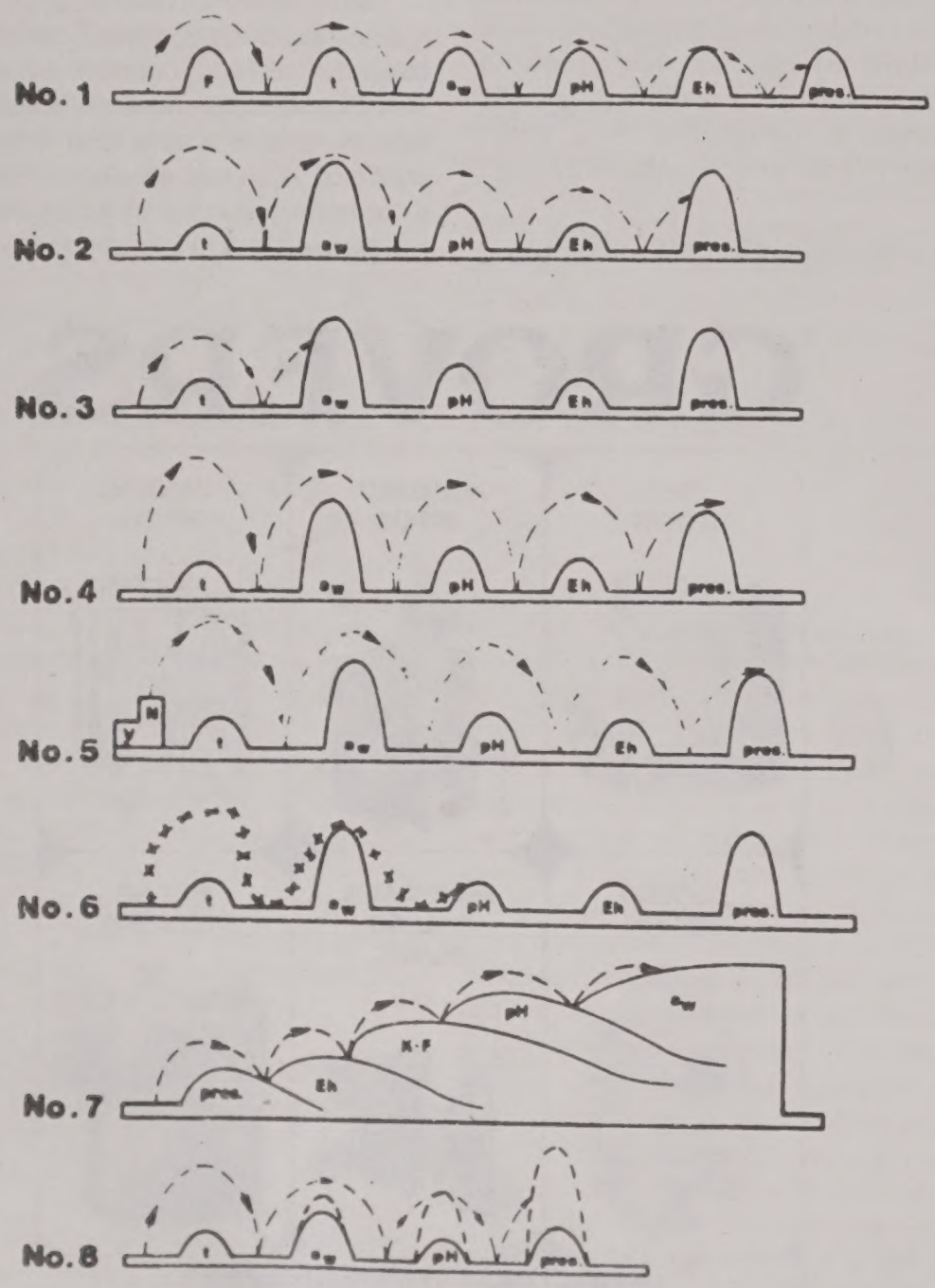

Fig. 1. Illustration of the hurdle effect, using eight examples. Symbols have the following meaning : F. heating; t, chilling; a_w, water activity; pH, acidification; E_h, redox potential; pres., preservatives; K-F, competitive flora; V, vitamins; N, nutrients.

Novel and Traditional Intermediate Moisture Foods based on Meat

The intermediate moisture foods (IMF) are stabilized by a_w in the range of 0.90-0.60, although additional hurdles, such as heating, preservatives, pH and E_h might be important too. Many traditional and some novel IMF are known. Such foods need no refrigeration during storage.

Conclusions and Perspectives

Food preservation based on combined methods is applicable for the improvement of traditional products as well as the design of novel foods. Combined methods secure stable and safe foods in spite of a gentle preservation, and thus result in products with high sensory and nutritive properties. Research in combined processes has brought about admirable results in Latin America within the CYTED-D project. Also combined methods for food preservation are currently studied in Europe within a project of the FLAIRPROGRAM, and eleven countries participate in this project.

Several concepts for improvement of the safety, stability and quality of foods have emerged in recent years and are pursued. Now, taking into consideration Good Manufacturing Practice (i.e. a better defined GMP), Hurdle Technology, the HACCP Concept and Predictive Microbiology, an overall strategy for better foods should be derived, which is applicable in industry as well as in small and medium size enterprises, if possible world-wide.

Flavours For Food Industry

by

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Flavours are complex, mostly non-nutritive components, which exert profound effect at extremely low concentrations and play a key role not only in the acceptance but also in the enjoyment of foods and thus in the delivery of nutrition. The basic essential nutrients for human life are just 40 to 50 chemical substances such as few starches and sugars, amino acids fats, vitamins and salts, out of thousands of chemical substances that are present in what nature provides to us as 'food'. It is possible to fabricate foods based on these essential nutrients alone. Then food becomes totally tasteless, monotonous and one may even loose hunger by seeing such foods. Some of the remaining thousands of components, which may be nutritionally irrelevant, contribute to appearance, colour, taste, aroma, feel and texture which provide aesthetic, appealing and appetizing value to food. When food is eaten the flavouring components that are present in food are perceived, their sensation immediately evokes the feelings about the degree of enjoyment or pleasure of eating such foods. It is important to note that without desirable flavours many essential foods containing high quality proteins, vitamins, minerals etc. would not be eaten however inexpensive and safe they are. From the nutritional point of view evidence is now accumulating that enjoyment of food plays a vital role in digestion and assimilation of nutrients in human system. This is an extremely important indirect role of flavours which has elevated the position of flavour in total food system.

Historically the role of flavours was certainly not an intentional role. For a primitive man initially consumption of high calorie diet became essential to stay alive.

A handful of spices, herbs, honey, and extracts that were used in the past to convert abundantly but extremely bland foods into tasty meals has now developed into an endless list. The ingredients available subsequent to spices and extracts for flavour formulation were initially limited to essential oils and the resulting flavours formulated were not very attractive. A new era began for food flavouring during 1950's with the development of gas chromatograph. With the advent of instrumentation techniques in flavour isolation, systematic identification of constituents in natural flavours began and more than 5000 compounds have been identified [1]as flavour components during the past over two decades. This combined with organoleptic perception have sparked a vast programme of flavour research and as a result we have been seeing an exponential growth in many exciting and satisfying new food flavourings. Flavour was defined by, ([2]Hall, 1968) as "the sum of those characteristics of any material taken in the mouth, perceived principally by the senses of taste and smell and also the general pain and tactile receptors in the mouth, as received and intrepreted by the brain". However the simple Dictionery definition is - "the blend of taste and smell sensations evoked by a substance in the mouth.

Thus, flavour is a combination of - Taste, Odour and the perceptions of pungency, coolness and warmth.

Generally condiments, spices, fruit juices in concentrated form, process flavours, oleoresin, essential oils and aromatic chemicals are used for flavouring foods. Based on spices and herbs several spice blends like chillie powders, curry powders, poultry seasonings etc. are made which are considered as seasonings by consumers. Industrial seasonings are different and these contain one or more spices or their extracts, in addition to other ingredients like acidulants, salts, sugars and mono sodium glutamate. Flavours are added to foods to create or to enchance the desirable taste, odour and mouth feel.

Functionally flavours are used to create non-existing flavours like cola flavours, to complemet the flavours of basic foods, to replace processing losses, to simulate more expensive or less practical natural flavours with nature-identical or synthetic flavourings.

Flavouring substances are generally classified into three categories Viz., Natural, Nature-identical and Synthetic flavours.

Flavours which are either naturally occuring in foods, or generated during cooking roasting or processing of foods, or may be generated by enzymatic reactions or fermentations- are generally considered as natural flavours.

Duplicates of naturally occuring aromatic compounds in foods such Ethyl butyrate, Allyl hexanoate, Anisic aldehyde etc. which have been synthesized or manufactured and added to foods are called nature-identical flavours. These are chemically identical to substances that are present in natural or processed foods meant for human consumption.

Flavour compounds which have not been identified or found in natural or processed food products intended for human consumption, when added to foods are called synthetic flavouring or artificial flavourings.

Under healthful living scenario in the U.S. and in few other countries some consumer preferences are for natural flavourings. However, the sources and availability of raw materials to produce those natural flavours will continue to be critical. Further natural flavours are much more expensive and for most product application the cost benefit ratio require serious verification. As a result the major and continuing task is to find the nature-identical and synthetic substances, which are quite economical. The powerful trace compounds found in natural flavours as and when identified and made available to the flavourists, are being utilised to achieve remarkable results and this continuing process will be producing excellent nature-identical flavours.

Efforts are also on to extend the natural flavours by 3 microbial bio transfermation, by genetic manipulations and by " enzyme modiciations of natural substances. However, the major constraints in this area today are large research budgets, large capital investments and getting cheaper starting materials. These again are most expensive for many products applications.

Nature-identical or synthetic flavours are characteristically more uniform in quality and more reliable in supply and the safety parameters can be easily determined. Most of the ingredients in flavours are the same as what is naturally present.

Fewer agricultural produces are converted by food processing industry into thousands

Paper presented at IFCON-93 (3rd International Food Convention) at Central Food Technological Research Institute, Mysore from 7-12 Sept. 1993

of varieties of processed foods in different forms with strong consumer acceptance.

The scope for new processed foods is expanding in the upcoming Indian market. However, it is to be remembered that the money spent on food in India is anywhere from 4 - 70% of their take - home pay.

This particular area, mainly the surplus money available decides the spending pattern on processed foods. With the rise in income levels of middle class and lower income groups in India, the money available to spend on processed food has increased. It is to be noted that the average money spent on food in the U.S. is about 13 - 15% out of the take-home salary.

To-day, food processing industry is under pressure as a result of increased domestic and international competition to exploit developing markets, government regulations and unpredictable tax structures. In this competitive environment food industry needs to work in new product opportunity areas which require adoption and integration of new process and use of more functional, innovative flavours, to bring about the best.

Many new processed foods and beverages are introduced every year with high cost for their development and for providing initial huge stock throughout the market place. The product failures after their introduction, appear to be reasonably large and as a result the total investment which runs into several crores of rupees every year for new product development and market introduction goes as waste.

In recent seminar organised by food industry trade in the U.S., it was concluded that taste would continue to be the driving force in the food processing industry for the 1990's and beyond. If the product does not taste good it will not sell very well in to-days highly competitive food market. While safety, nutrition, convenience and economy are important these criteria become least interesting if the product does not taste good. Thus the success of a new food product can be positively influenced by the right selection of flavour deliver system. Flavour is the major differentiating factor in brand identification and between brands of a similar product

It is common that many new food products are developed in strict confidentiality. Inspite of the fact that flavourings are key components in bringing out the much desired taste and organoleptic perceptions, flavourings are always decided at the end, that too without paying much attention on functional attributes of flavourings that are selected. Flavour selection which may call for development of new flavours or modifying the existing flavours to suit the food product requirements is an extremely important task. This requires technical coorporation between well experienced flavourist, and the food specialist in finalising more functional, product oriented flavours by paying attention to process conditions and food ingredients used. Flavour houses do work in strict confidence in developing the custom made Flavours. This type of technical co-ordination greatly eliminates product failures.

To-day, food processing industry is totally aware of the role of flavourings in food. Since processed foods market is expanding at 15 to 20% level per annum, the demand for functional flavours which can withstand the varied and new processing conditions, is becoming more relevant. The major consumers of flavours are segmentwise - Soft drinks, Bakery Products, Confectionery, Fruit and Vegetable products, Dairy products including ice-creams and snack food industry.

Soft drink industry is made up of both carbonated and non- carbonated beverages. The sale of carbonated beverages have an edge over still beverages and it is estimated that this market in India is now of the order of 113 million cases annually and is increasing steadily. The consumer preferences is for Cola, Lemon-lime, Orange followed by insignificant quantities of miscellaneous flavoured beverages. The consumers while willing to consume the increasing quantum of soft drinks, seem unwilling to venture much beyond the traditional citrus and cola flavours which have established their popularity. This is not due to lack of innovation on the part of flavour manufactures, who regularly introduce exotic flavours in the markets, usually without much success. Herbal waters have recently gained good entrance in European Markets which blends taste and healthfulness. This is something extra in the formulation like a mint for other herbal flavour mixed with fruit flavour. This has further taken a turn into functional beverages - with value additions such as Vitamins, Extracts of ginseng root etc., These drinks became popular in Japan, Far-east and in Europe. Consumer interest in juice drinks, isotonics and flavoured water is on the rise. The exotic flavours like passion fruit, guava, papaya and mango are in demand.

The bakery industry which was expanding rapidly, as bakery products are slowly penetrating the rural segment of the market, remained more or less static during later part of 1992 and first half of 1993 due to general recession. Generally apart from enlarging the present production of known and established products, this industry is always attempting new products with great success in the market. Out of about 2 million tonnes of bakery products produced in our country, biscuits, are produced to the extent of nearly one million tonnes. Here the use of fairly high temperatures in baking necessitates the use of flavours with heat resistance and reduced volatility.

Butter is an important fat used in baked foods. Since butter is expensive, use of margarine with butter flavours became quite common. Vanilla, Butterscotch, Chocolate, Orange, Cashewnut, Almond and Milk flavours which can withstand oven temperatures are the most commonly used flavours. Innovative flavour houses always attempt to give flavours with more functionality to the food industry to improve the taste profile of existing brands and new products.

Confectionery includes sugar and chocolate confectionery and in some part of the world even cakes are included. The flavours developed for these products are again required to withstand high processing temperatures. Flavours with fresh fruit notes are more appreciated in sweet candies and coated confections. Fruit flavours, spices and nutty flavours, chocolate, dairy flavours, find extensive use in all types of confectionery.

Snack food which is the second largest category after soft drink market in the U.S. in using flavours, has started appearing in variety of flavours in Indian Market. Flavour trends are trying to keep pace with development of snack food industry. The foremost flavour in potato chip is salt, followed by spices and red chilies. New flavours are tomato, butter cream, cheese, spearmint and others. Corn snacks include puffs, fries and popcorn. Here again after salt and spices the other flavours used are butter, cheese and roasted corn type flavours. Even sweet type flavours become common like honey-lemon, fruity flavours, chocolate etc. Snack rings with taste of herbs, butter milk and mild onion which are available in other part of the world can be tried which have consumer appeal. The success of this segment in Indian market however is not as anticipated when compared to other parts of the world. This may be due to cost constraints and purchasing power. A 100 gms. pack of any of these snack packs are costing about Rs. 8/- compared to biscuits which costs about Rs. 4/- for similar quantity.

Further, to meet the nutritional requirements of growing population with limited natural food resources, there is spurt in fabricated foods, textured vegetables proteins as meat extenders or analogues, imitation milks using oil seed proteins etc. The flavour industry is totally geared upto this situation and are constantly developing flavours to mask the unacceptable beany notes and further providing flavours as close to natural tone which are quite acceptable.

Flavoured milk and ice-cream industry forms the major segment in dairy products area utilizing flavours. A variety of fruits flavours, nutty flavours, vanilla and dairy

flavours and exotic flavours combinations are tried in the segment.

The dry food market which began developing during 1920's has grown into a diversified market with the introduction of instant food mixes like dry beverages mixes, gelatin dessert, custard powders, ice-cream mixes, soup and sauce mixes. The use of spray dried flavours for such mixers improve the keeping quality.

The most significant factor in the market during 1992 was the meek world economy. Consequently the sales in many markets remained static, due to lowered consumer spending. During the past one year with all the ongoing recession in India, the overall economy frame work was well laid to really open up the country to potentially high significant markets. With a growing 850 million people and particularly with rapidly expanding middle class, India holds tantalizing potential. In the International sense free traffic began on January 1st 1993, between the European Economic Community. This means a common market for 350 million consumers in Europe. All these developments will have an influence on food processing industry and consequently on flavour houses.

In India the manufacture and sale of flavouring essences are controlled by prevention of Food Adulteration Act, 1954 and subsequent amendments. Indian P.F.A. Rules recognises three different classes of flavours as: Natural flavouring substances, Nature-identical flavouring substance and Artificial flavouring substances. The P.F.A, clearly stated the negative list of items which should not be used in the flavour manufacture. The legislation clearly states that when an extraneous flavouring agent has been added to any article of food, the label present on that particular article of food shall carry a statement in capital letters as "CONTAINED ADDED FLAVOUR."

When natural ingredients are added to flavours, sometimes we come across minor variations in colour. To overcome this problem and to give uniform colourshade, synthetic colours are added to flavours. Further, for applications in soft drinks, cream centres and few other applications, flavour emulsions are made using flavour and colour together. This helps small manufacturers of soft drinks so that they do not need to look around for further additions of colour. Recently a draft notification was issued by PFA authorities barring the use of synthetic colours in flavouring essences. This is totally unwarranted draft legislation which has no purpose. By this colours are to be added separately and small manufacturers of soft drinks will be put into greater problems and this may even lead to use of non-permitted colours. Hence I suggest this august body to recommend strongly that this proposed draft notification be withdrawn.

To sum up, consumers are becoming more sophisticated, more educated and more open minded about new foods, new ideas, new life styles relating to food selection and people have confidence in their own judgement. Many new opportunities exist in development of new and diversified food and other products which uses flavours. To meet the increased consumer sophistication in the expanding competitive food market, innovative flavours with more functionality are constantly made available to food industry, to improve the much desired taste not only in the new food products but also in existing brands.

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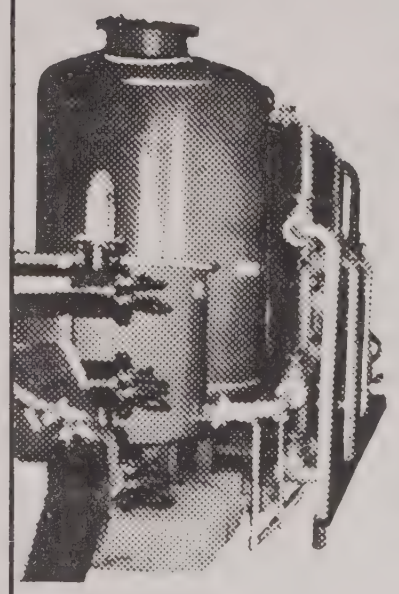

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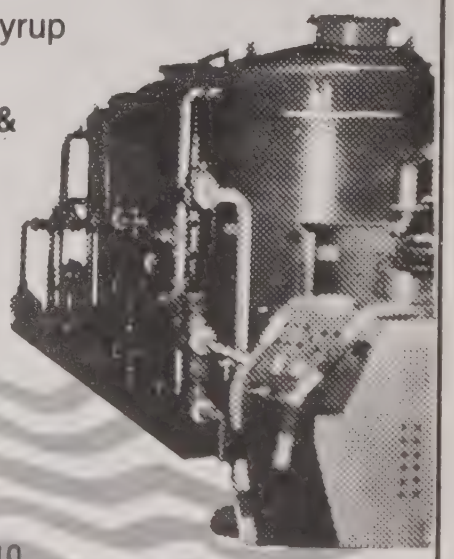

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Dairy Ingredients in Bakery Products - A Review

by

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Introduction

Bakers have represented major commercial users of dairy products ever since about 1910, when milk became accepted as an important bread ingredient (Kirk, 1971). As an agro-based industry, the future of dairy industry lies in the food industry; baking industry being one of its sector.

The dairy products are not only used for their significant effect on the physical and chemical properties of baked products (Bennion and Bamford, 1973a), but also because of their nutritional contribution to these items (Rajor **et. al.**, 1989; Mann, 1992). However, dairy products are one of the most costly raw materials utilized in the baking industry.

The profusion of dairy products now being offered to the baking industry as a consequence of adoption of newer techniques such as membrane-filtration, ion-exchange, chromatography, immobilized-enzyme, etc., may cause confusion for the baker. The following write-up would enable a baker to acquire a fuller insight into the newer derivatives so that he can fit into the latest trend being followed in the baking industry.

Technological properties of milk constituents in relation to baking properties

The milk constituents have certain functionalities either by themselves or in combination with other ingredients which may be usefully exploited in baked products. These are dealt with herein.

Milk Fat

Milk fat, although more expensive than other edible fats, is a much appreciated ingredient of flour confectionery products because of its superior taste and flavour.

The important characteristics which distinguish milk fat from other edible fats are (Bennion and Bamford, 1973b; Gueriviere, 1982; Kirkpatrick, 1982; Tow, 1985) :

- perceived as less processed,

- has intrinsically attractive flavours which is pleasing to human palate,

- higher proportion of short chain fatty acids contribute to ease of digestibility,

- has fat soluble vitamins such as A, D, E and K,

- relatively stable during storage.

- melting and plastic range do not suit in the baking,

- has desirable and undesirable nutritional connotations, and

- comparatively costly source of edible fat.

When used in baking, it serves much the same purpose as do other fats, namely to lubricate and weaken the gluten structure and thereby shorten and tenderize the product (Craig and Colmey, 1971). The crystalline nature of milk fat assists in the formation of the initial foam structure of batters. After baking, when the product 'sets', the fat partly recrystallizes and assists in maintaining a moist texture by binding the water (Parkinson, 1984).

Milk Proteins

About 80% of protein occurring in milk is named 'casein', the other part being referred to as 'serum' or 'whey' proteins. The characteristics of milk proteins which are advantageously exploited in the preparation of baked goods are (Hugunin, 1982):

(a) stabilization of food during preparation, conservation and storage, which is brought about by prevention / lessening of water separation, fat separation and escape of gas,

(b) improvement and/or maintenance of consistency and structure of a food, and

(c) many of the flavours and aromas which develop during baking result from thermal degradation of protein and amino acids (Table 1).

Table 1 : End products of thermal degradation of proteins responsible for flavour of bakery items.

Amino acids	Flavour simulating that of some bakery product
Arginine, Histidine	Bread like
Leucine	Bread like (toasted)
Proline	Bakery, Cracker
Ornithine	Cracker-like
Glutamine, Lysine	Buttery

Source : Hugunin, 1982.

Casein : Casein by itself does not have a great deal of application in the baking industry, being difficult to handle and poorly dispersible. The manufacture of caseinates is necessary to utilize the functionality of casein. Caseinate possesses good water and oil-binding capacity, aeration property and plays a major role in high-moisture and/or high-fat baked products. It can be used to increase the viscosity of aqueous systems (Parkinson, 1984; Tow, 1985).

Whey Proteins : The whey proteins viz., B-lactalbumin and α - lactalbumin comprise 70-80% of whey protein fraction providing one of the highest known protein efficiency ratios among commonly available protein materials. Lactalbumin is exceptionally high in lysine content and thus act as a natural supplement for cereal proteins (Craig and Colmey, 1971). Whey proteins possess oil- and water-binding properties, good foaming properties, are soluble over a wide pH range and forms an irreversible gel when heated to temperatures above 70°C (Cheeseman, 1975; Parkinson, 1984).

Lactose

Lactose is commercially produced from whey, the by-product of cheese, casein, chhana and paneer.

Some important properties of lactose for baking purpose are (Mertens and Mykleby, 1967; Craig and Colmey, 1971; Nickerson, 1974; Mc Mullin et. al., 1975; Holmes and Lopez, 1977; Mann, 1982b):

(a) it enhances flavour of products such as vanilla, chocolate, spice etc. and maintains the flavour, colour and aroma of baked goods by retarding losses during processing and baking,

(b) owing to its sweetness (i.e. 1/5th as sweet as sucrose), it may replace 10-50% of the sugar or maize sugar content in some bakery items and forms a convenient bulking agent,

(c) it binds water to give a tender, more moist and better eating quality product,

(d) its emulsifying property enables replacing and/or increasing the efficiency of shortening,

(e) it gives tenderizing effect and strength-

ens the cell walls, and

(f) being non-fermentable by yeast during processing, it is made available for Maillard reaction and Caramelization to occur at the high temperatures prevailing in the oven, resulting in golden brown crust colour.

Minerals

Minerals are of some significance as nutritional adjuncts in bread and other bakery products and comprise part of milk's buffer system (Mertens and Mykleby, 1967). Ions such as calcium and phosphorous bring about changes in casein and are used to modify skim milk for special bakery blends (Craig and Colmey, 1971).

Milk and milkproducts for baking industry

Based on the properties and functionalities of milk and its constituents, the milk industry has developed traditional, new and modern milk and milk-based products which have been exploited advantageously in bakeries (Gennip, 1982). The typical composition and functional properties of some dairy-based ingredients are depicted in Table 2 and Table 3 respectively.

The common forms in which milk solids are available as food ingredients are discussed under the following heads:

Milk/Skim milk : Being a natural emulsion, milk is the most important moistening agent employed in bakery, both in bread and confectionery. It is employed in two ways (Brown, 1983):

(i) as an ingredient in a whole range of baked products viz., bread, rolls, bun goods, cakes, sponges, scones, doughnuts and biscuits where it improves the dough or batter handling properties, flavour, crust colour and elevates the nutritional value. In this range of products, no attempt is made to disclose the presence of milk.

(ii) for production of bread with a sufficiently high level of milk solids to allow such products to be designated as 'milk bread' or 'skimmed milk bread', etc.

Condensed milk : Condensed milk with 30-40% total solids (TS) has lost its former acceptance as a baking ingredient due to uneconomic shipping, handling, storage and spoilage compared to the use of dried milks (Mertens and Mykleby, 1967).

Whole milk powders : Generally whole milk powder is used to a limited extent in baking due to its high cost. However, when used for the production of milk bread it contributes a rich character. Whole milk designed for breadmaking is heat treated in liquid form, prior to drying, to denature the proteins responsible for lowering the bread volume (Mertens and Mykleby, 1967; Kirk, 1971; Brown, 1983).

Non-Fat Dry Milk : Non fat dry milk (NFDM) is the most widely used milk product in baking industry. With improved knowledge of baking mechanisms, it has become clear that different applications require slightly different powders, e.g. for traditional baking applications where protein gelation and water/fat binding are required or those possessing delicate flavours such as icings, fillings, etc., a low heat-powder is desirable, whereas for freeze-thaw stability and high carbohydrate systems, a high-heat powder is essential (Mertens and Mykleby, 1967; Parkinson, 1984; Tow, 1985). NFDM having relatively large proportion of undenatured whey proteins can be utilized with satisfactory results in continuous bread making (Brown, 1983). Heat treated NFDM improves the crust colour, loaf volume and nutritional quality when employed in the manufacture of bread (Harper et.al., 1983).

In bakery products it is particularly advantageous in the following manner (Craig and Colmey, 1971; Kirk, 1971; Mann, 1982b; Brown, 1983) : (a) imparts a richer flavour, and body and resilience to crumb of bread, (b) improves absorption and exerts a buffering action in dough, (c) exerts a tenderizing effect on crumb texture, (d) aids batter stability and improve mixing tolerance, fermentation tolerance, crust and crumb colour, break and shred, and loaf volume, (e) increases the keeping quality and (f) enhances the nutritional quality.

Cream/Dried cream : The desirable flavour and texture of cream is used to enhance the appeal of products such as cream cakes. The cream to be used should preferably be aged at 2-5°C for at least 24 hours in order to achieve the desired solid fat content and viscosity in the cream. Dried cream has broader applications in bakery products (Parkinson, 1984; Lane, 1985). Creams, both sweet and sour, are spray dried on a limited basis to meet the demand for quality fats (Mertens and Mykleby, 1967).

Butter : Traditionally butter was the fat used in baking and has still maintained its appeal, though suffers competition from vegetable fat complexes (margarines). It has intrinsic flavour which is superior to other edible fats. Unfortunately, there is a tendency for the product to become rancid due to decomposition of the glycerides (Tow, 1985)

Butter was found suitable for use in bakery items, if it was cooled and had a dry, stiff consistency. Its use results in freshness and

Table 2 : Typical composition of dairy - based ingredients

Ingredient	Moisture	Protein	Fat	Lactose	Ash	Ca	P
	(%)						
NFDM	3.0	35.9	0.8	52.3	8.0	1.31	1.02
Dried buttermilk	2.8	34.3	5.3	50.0	7.6	1.25	0.97
Casein	7.0	88.0	1.0	-	4.0	-	-
Caseinate	3-5	90-94	0.7-1	-	6-7	-	-
Dried whey	4.5	12.9	1.1	73.5	8.0	0.65	0.59
WPC	2.0	20-60	2-9	18-60	3-18	-	-
Lactose	0.5	0.1	0.1	99.0	0.2	-	-
Delactosed or lactose - reduced whey	3.0	18-25	2-3.5	45-55	13-22	-	-

NFDM = Non-Fat-Dry-Milk; WPC = Whey Protein Concentrate.
Source : Anonymous, 1984b.

Table 3 : Functional characteristics of milk-based products

Functions	NFDM	Dairy blends*			Sweet dairy Whey	Cereal blend Whey-Soy (1:1)
		High protein	Medium protein	Low protein		
Water absorption (%)	100	110	90	75	25-50	100
Buffer value	Exc.	Exc.	Good	Good	Fair	Good
Lactose colour reaction	Good	Good	Good	Good	Exc.	Good
Tenderizing effect	Good	Good	Good	Good	Exc.	Good
Body and Resilience	Good	Good	Good	Satis.	Fair	Good
Nutrition	Exc.	Exc.	Good	Good	Good	Good

NFDM = Non-Fat Dry Milk; Exc. = Excellent; Satis. = Satisfactory. * Dairy blends composed of whey and caseinate with or without NFDM to contain high (30-35%), medium (~20%) or low (15%) protein content.
Source : Kirk, 1971.

softness, improves the flavour and shortens the bakery items. Its use is mainly dependent on the need for flavour enhancement in products such as butter sponges, savouries, short bread and short cake (Parkinson, 1984; Tow, 1985). Dairy butter presents no problems in yeast dough products or crackers, their use in certain types of cakes and short breads was more restricted and was found entirely unsuitable for puff pastry and Danish pastry (Mann, 1980).

Nowadays, butter fat is tailored for specific uses by means of processes such as fractionation, hydrogenation, plasticizing and other techniques (Tow, 1985).

Butteroil/Anhydrous Milk Fat : Butteroil (BO) / Anhydrous milk fat (AMF), sometimes denatured by vanillin or carotene, can be substituted for butter for use in bakery products, where the moisture content must be limited (Mann, 1980; Parkinson, 1984). Traditionally, BO was used for enriching butter sponges, savouries and biscuits such as short bread (Tow, 1985). Madeira cakes made with BO gave similar cake volumes but these were inferior to those made with margarine (Mann, 1980).

Fractionated butter fat : Physical properties of milk fat vary throughout the year and usually it has too soft a consistency. Consequently, doughs prepared using such butter may be less suitable for proper processing. Since hardening by means of hydrogenation would have an unfavourable effect on the naturalness of the product, use of fractionated butter fat (FBF) is being made in puff, pastry, short cakes and croissants. The croissants made with FBF were claimed to possess superior flavour than those made with baker's fat (Anon., 1986; Mann, 1982b).

Depending on the melting fraction of the fat, it would have specific application in certain bakery products. For instance, high-melting fat fraction has been found suitable for croissants, Danish pastry and puff pastry; low-middle melting fat fraction for cakes and biscuits such as short bread; and low-melting fat fraction has been found beneficial in butter creams (Anon., 1986).

Fat blends : A blend of milk fat and/or vegetable fat with skim milk or powdered speciality products has been used advantageously in making satisfactory bakery products such as puff-pastry butter. The free running properties ensures a trouble-free mixing process suitable for ready-to-use flours (Gennip, 1982; Tow, 1985; Pedersen, 1988). A blend of AMF and hydrogenated palm oil (40:60), when used as a shortening in cake manufacture gave excellent baking performance, without adversely affecting the specific volume of the product (Nor et.al., 1990).

Butter milk/condensed butter milk/butter milk powder : Butter milk either in fluid, concentrated or dried form have been used in the manufacture of some bakery products such as bread, biscuits, cakes, etc. It is a valuable ingredient in speciality bakery products requiring short texture, without excessive dryness. It has been used as a flavouring agent in rye-bread for many years. It can also be used with good results in continuous bread operations at levels higher than NFDM. Buttermilk solids at usage level of 3% of flour weight has been recommended (Mertens and Mykleby, 1967; Mann, 1982b).

The functional role played by buttermilk solids in bakery products are (Kirk, 1971; Arora and Mathur, 1980; Mostafa et.al., 1982):

(a) improves the flavour,

(b) improves the crumb texture and structure by virtue of its higher water absorption capacity,

(c) increases the loaf volume of bread owing to the presence of lecithin,

(d) makes the product less crumbly during slicing,

(e) imparts better toasting qualities,

(f) enhances the nutritive value of the product.

Incorporation of dried cultured butter milk solids accentuates the flavour of chocolate cakes, sour rye breads and certain other speciality baked products (Mertens and Mykleby, 1967).

Whey / concentrated whey / whey powder: Due to increased emphasis on whey utilization coupled with recent technological advances and continuing rise in NFDM prices, whey products are assuming major interest for bakers (Craig and Colmey, 1971; Kosaric and Asher, 1982).

'Breading' or 'crumb coatings' used on fried products contain whey as a critical ingredient (Kirk, 1971). Untreated sweet whey produces poor quality bread because of the suppressing effect on loaf volume and crumb structure (Harper et.al., 1983). Hence whey designed for use in bakery products is usually demineralized and is often heated high enough to denature whey proteins for improving their functionality (Craig and Colmey, 1971; Mann, 1980). Addition of 0.2% di-ammonium phosphate (on flour basis) can correct for most of the suppressant activity of sweet whey on loaf volume and crumb structure (Harper **et.al.**, 1983).

In breadmaking, whey is added at ~ 15-20% by weight of flour (Kolpakova **et al.**, 1990). According to Vasin (1988), only the whey having positive redox potential could control the rheological properties of dough in breadmaking.

Whey powder is compositionally similar to NFDM, except that it lacks casein and contains ~ 20% more lactose. As casein is reported to mask the flavour, its absence here, improves the flavour of the bakery products. The higher lactose content makes it especially desirable where high crust colour is essential. Furthermore, whey solids acts as an emulsifier and has good water binding properties (Craig and Colmey, 1971; Markianova **et al.**, 1975; Chumachenko **et al.**, 1977).

Dried cottage cheese whey with its inherent high acidity finds application in sour dough and 'instant culture dough' (speeded-up hearth bread doughs) formulations; and can be used in muffins, devils' food cake, yellow layer cake, and rye and dark breads, wherein they impart a superior flavour (Craig and Colmey, 1971; Kirk, 1973; Mann, 1980). Whey solids are used at levels ranging from 3 to 10% in products such as bread, crackers, icings, frostings, batter mixes, confections, etc. for getting optimum results (Anon., 1985).

Whey solids offers the following advantages when used in bakery products:

(a) improves the organoleptic property and freshness of products (Platsas **et al.**, 1988; Gueriviere, 1982; Polandova **et al.**, 1988; Sturmovich and Liepinyaz, 1991),

(b) stimulates growth of yeasts (Mann, 1982b) and thereby reduces fermentation time in breadmaking (Kolpakova **et al.**, 1990; Sturmovich and Liepinyaz, 1991),

(c) improves crust colour and shortness of crust (Craig and Colmey, 1971; Gueriviere, 1982; Anon., 1985),

(d) provides shortening or tenderizing effect in cake and sponge products (Holmes, 1979; Brown, 1983; Anon., 1985),

(e) improves the texture of rolls (Mann, 1980),

(f) can act as fillers owing to the high lactose content (Parkinson, 1984),

(g) increases loaf volume and gives good crumb grains (Mann, 1980; Harper **et al.**, 1983; Polandova **et al.**, 1988),

(h) improves the keeping quality of sand cakes, biscuits, bread, crackers, etc. (Mann, 1982 a, b; Anon., 1985),

(i) use of concentrated (40% TS) tvorog whey or whey containing calcium propionate, when used in bread making protected them against mould infection (Mann, 1980; Majchrzak **et al.**, 1984), and

(j) enhances the nutritional quality (Kolpakova **et al.**, 1990).

The various forms in which whey has been utilized in baking include fermented (using L. acidophilus) cheese whey (Mann, 1980), lipid-dried sweet/acid whey (Cuddy and Zall, 1982), milkwhey blends (Craig and Colmey, 1971), fortified whey products containing caseinate, NFDM or buttermilk solids, soy or corn flour or other hydrophillic

agent and edible salts (Guy **et al.**, 1971; Kirk, 1971, 1973; Anon., 1984b, 1985).

Caseinates : The use of caseinates would be highly beneficial as they contain organically bound calcium and phosphorous, which are indispensable for the development of good skeleton and also competes the value of wheat protein (Humphries and Southward, 1974; Kowalczuk and Krasnowska, 1976). It is promoted as a nutritional supplement for the amino acids of breads (Craig and Colmey, 1971).

Their functional role in baked goods includes :

(a) enhances the flavour, appearance and extrusion properties (Wiedmann and Schuler, 1988),

(b) high water-binding capacity (5-6 times that of NFDM), which is helpful in controlling the texture and uniformity in doughnuts, cookies, waffles and yeast-raised doughs (Craig and Colmey, 1971),

(c) emulsifying property through fat coating or encapsulation (Mertens and Mykleby, 1967; Parkinson, 1984), and

(d) aeration properties (Parkinson, 1984).

Its area of application include peripheral area of artificial cream fillings and toppings, cake mixes, doughnuts and protein-fortified nutritional baked foods (Parkinson, 1984; Tow, 1985). Replacement of upto 20% of flour in dough by sodium or calcium caseinate had little effect on the sensory qualities of petit beurre biscuits. However, while the former resulted in more brittle product, the latter gave harder ones and resulted in blowing (Schar **et. al.**, 1988).

With suitable blending, caseinates can produce a wide range of functional properties e.g. a spectrum of blends of sodium and calcium caseinates can induce a corresponding spectrum of rheological properties e.g. of decreasing viscosity (Parkinson, 1984).

Whey protein concentrates: Whey protein concentrates (WPC) having 30-75% protein are made with help of ultrafiltration, gelfiltration, metaphosphate complexing coupled with electrodialysis and lactose separation (Sanchez **et.al.**, 1984). These products combine versatile functionality with superior nutritional properties. Substitution of milk powders by WPC containing about 25-35% protein in bakery products, can be very cost-effective and can increase the functionality of the system (Parkinson, 1984).

The functionalities of WPCs such as acid solubility, gel formation and whipping ability should be of interest to the baker (Craig and Colmey, 1971).

Its role in baking industry involves:

(a) giving a shiny, attractive surface to bread, pies, crescent rolls and pastries (Anon., 1984a),

(b) imparting flavour and colour (Kosaric and Asher, 1982; Schaap, 1982),

(c) increases moisture retention by about 10% and can cut oil absorption by 15% (Anon., 1984a),

(d) aids in emulsification, foam expansion and foam stability (Sanchez **et. al.**, 1984),

(e) increases the elasticity of dough in breadmaking, if WPCs are heat treated high enough (Sanchez **et. al.**, 1984),

(f) enables reduction in flour consumption in breadmaking (Virabyan **et. al.**, 1988),

(g) can serve as an egg extender, replacing upto 50% of egg solids in cake and doughnuts; and as complete substitute in muffins, waffle and pancake mixes (Anon., 1983, 1984a; Wit, 1984), and

(h) for fortification of products such as bread (Schaap, 1982; Harper and Zadow, 1984).

Bread made with WPC was improved by partial denaturation of whey protein (Sanchez **et al.**, 1984). However, at higher level of denaturation, the sensory score of the product tended to decline (Harper and Zadow, 1984). WPC does not affect the rate of yeast fermentation (Mann, 1982b).

Some problems associated with incorporation of WPC in baking formulation are retardation of the maturity of dough in bread manufacture (Marston and Zadow, 1983), deleterious effect on loaf weight and a weaker, less elastic dough which ruptures readily on gas expansion during baking (Mann, 1982b).

Co-precipitates : The combination of casein and whey protein precipitated together by acidification of heated milk is referred to as 'co-precipitate'. It may also cover combinations of proteins from milk and other biological systems (Southward and Goldman, 1975). The isoelectric forms of co-precipitates are designed for use in low-moisture baked items where minimal absorption is desired. Levels upto 30% can be incorporated in finished goods with good appearance and texture (Craig and Colmey, 1971).

Their functional properties of importance in baked goods include water absorption, emulsification, foaming power and foam stability (Southward and Goldman, 1975).

Due to the presence of whey proteins along with casein, co-precipitates are nutritionally superior. Their addition renders better rheological properties to some baked foods. Its potential use in bread making industry is for protein fortification and replacement of NFDM (Southward and Goldman, 1975; Jakubczyk **et. al.**, 1977).

Milk proteinates : Calcium and sodium proteinates have been found to be advantageous in commercial bread production owing to their high solubility, water binding capacity, protein content and biological value (Haber and Jakubczyk, 1975).

Use of milk proteinate at levels of 5-6% resulted in improved quality and nutritive value of white, wheat and ryebreads (Haber and Jakubczyk, 1975; Sanchez **et al.**, 1984).

Lactose : Lactose is rarely used as an ingredient in baked formulations, but is normally used as a part of another ingredient (Parkinson, 1984). The functionality of lactose has already been dealt earlier while discussing the role of milk constituents. Some additional specific applications wherein it has been used advantageously are:

(a) bread containing milk sugar, when toasted, browns more readily and evenly than the one devoid of lactose. It produces a golden brown crust colour in products such as speciality breads, rolls, sweet goods and Danish, that does not turn dull upon storage (Mertens and Mykleby, 1967; Craig and Colmey, 1971),

(b) its low sweetness helps to produce high solids icings without imparting excessive sweetness (Hugunin, 1982),

(c) when used to replace 10-25% of other sugars in 'high ratio' (i.e. high sugar, high moisture) cakes and muffins, it produces a high level of tenderness without adversely affecting sweetness, cake volume, cake height or crust colour (Craig and Colmey, 1971; Goldman **et.al.**, 1978),

(d) it increases the bread and cake volumes by virtue of its tenderizing effect and strengthening of the cell walls (Holmes and Lopez, 1977), and

(e) it is claimed to enhance the keeping quality of cakes and bread by 50-60% by virtue of its tenderizing effect (Holmes and Lopez, 1977; Mann, 1982b).

Lactose hydrolyzed whey products: Application of enzyme B-D-galactosidase helps to hydrolyze lactose in whey, rendering such whey-based bakery products suitable for consumption by lactoseintolerant individuals (Mann, 1981). The lactose hydrolyzed products (LHPs) should have about 75-90% of the lactose hydrolyzed and should be preferably demineralized in order to increase its functionality. It is usually added at the rate of 6% of flour basis in bread formulations (Ogunrinola **et.al.**, 1986; 1988). Its addition however entails modifications in the processing methods, when used to replace sugar in baked formulations (Mann, 1980).

The advantages offered by LHPs are (Anon., 1978; Mann, 1980; Drobot **et.al.**, 1981; Ogunrinola **et.al.**, 1986, 1988):

(a) can serve as a sugar substitute in the manufacture of bread, cakes, biscuits, etc.,

(b) can act as a brewing agent,

(c) imparts a better flavour and texture to some baked foods,

(d) doesn't pose any problem of lactose crystallization,

(e) gives good functional quality to the dough and reduces fermentation time in breadmaking,

(f) increases the loaf volume, gives higher porosity and crumb compressibility and improved crust colour in breadmaking,

(g) can serve as an egg-extender in cakes and pastries, and

(h) results in financial savings.

Cheese / cheese powder : Cheese is very much a flavouring ingredient (Mertens and Mykleby, 1967). The cheeses particularly suited for a particular bakery product are listed in Table 4. Intense flavoured Cheddar cheese is used where a portion of volatile cheese flavour is unavoidably lost during processing (Tow, 1985).

The largest single item purchased by the pizza business is Mozzarella/Pizza cheese. The important characteristics which a Mozzarella cheese should possess for use as a topping on pizza pie are moderate toughness, adequate stringiness and should shred, grind and slice with minimum of matting (Kosikowski, 1978). In the oven, the Mozzarella cheese shred should release enough fat to engulf the other ingredients in the pizza topping and still maintain their shape and stringiness (Siapantas, 1978). Acceptability of the pizza product is largely measured by the amount of Mozzarella cheese topping and the quality is measured by the way the cheese melts and the stretch or stringiness of the product (Hartzel, 1979). Use of homogenized milk Mozzarella cheese has been found beneficial as a topping on pizza pie owing to its superior flavour and the reduced fat leakage exhibited during the course of baking (Jana and Upadhyay, 1992).

Current developments in highly flavoured cheese powders has resulted in cost effective and more convenient methods of imparting cheese flavour to baked products with concomitant time and labour saving (Mertens and Mykleby, 1967; Parkinson, 1984). However, the loss of its flavour (volatile) during drying process cannot be avoided.

Yoghurt/yoghurt powders : Yoghurt and yoghurt powders can be used as a replacement for milk or sour cream to add sharpness or acidity to the baked products i.e. both sweet and savoury dishes (Hill, 1975; Parkinson, 1984).

Table 4 : Types of cheeses recommended for a particular bakery product

Cheese variety	Recommended bakery item in which cheese is an ingredient	Reference
Mature Cheddar cheese	Cheese biscuits and straws, Cheese sticks, Speciality breads, Hamburger, Buns, Muffins	56
Dried Cheddar cheese	Snack foods, Dry prepared mixes	11,50
Lancashire cheese	Cottage and fish pies	56
Cottage cheese	Sour dough formulations, muffins, Devils Food cake, yellow layer cake, lemon pudding, thich sauces for casseroles	42, 56
Bakers' cheese (Green or dried)	Cheese cakes, Pastries	11, 50
White cheese (Fromage Blanc)	Cheese cakes	67
Quarg cheese	Cakes, Cheese-cream baked goods, Fillings, Some confectioneries	16
Mozzarella cheese	Pizza, Cheeseburger, Tacos	25, 38, 64
Romano, Parmesan, Provolone	Pizza	25

Conclusion

The newer products mentioned in the article are indicative of the innovative thrust of the milk product industry. A range of milk derived food ingredients including different blends with cereals are expanding rapidly for application in the baking industry. Certain quality problems in the bakery product can be readily minimized or overcome by the use of existing or specially developed dairy ingredients. Through relatively expensive, if a baker uses the dairy ingredients judiciously to get optimum results, dairy solids will more than justify their cost in any bakery product. The stress on research and technological achievements will assure the continuing ability of the dairy industry to provide nutritious and functional ingredients for today's baker.

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Incidence of Yeasts From Different Sources

by

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Abstract

Fifteen yeast cultures were isolated from flowers, bread, lemon, apple and curd samples and identified by morphological and biochemical methods. These strains were identified as **Trichosporon eriense** (1) **Trichosporon melibiosaceum** (2) **Candida versatilis** (1), **Candida intermedia** (1), **Candida maltosa** (1), **Candida silvicultrix** (2), **Candida oleophila** (2), **Candida buinensis** (1), **Candida** spp. (3) and **Rhodotorula fujisanensis** (1). Candida spp. were the most frequently isolated yeasts as compared to the species of **Trichosporon** and **Rhodotorula.**

Introduction

Yeasts have served mankind for centuries by fermenting fruit juices, leavening of bread and making certain foods palatable and nutritious. The importance of yeasts has grown greater today owing to their use in variety of fermentation processes leading to ethanol production (Bothast **et al.**, 1986., Lazarova, 1986) and also for synthesizing certain vitamins, fats and proteins from simple sugars and ammonium nitrogen. However, some yeasts are known to cause plant and human diseases, others spoil foods or bring about deterioration of textiles and other materials. The present study, therefore, was conducted to determine the incidence of different types of yeast species encountered in flowers, fruits (lemon and apple), bread and dahi.

Materials and Methods

Samples of flowers (rose, toria, gurhal), apple, lemon, bread and dahi were collected under sterile conditions and stored at 4 °C till use. Dorsal and ventral surfaces of petals, nectar portion of flowers, surfaces of lemon and apple peels and bread surface were allowed to touch the sterile yeast extract malt extract peptone glucose (YMPG) agar (PH5.6) containing (per litre) : yeast extract (3 g), malt extract (3 g), peptone (5 g), glucose (10g) and agar (20 g). The dahi sample was streaked on the surface of YMPG agar in sterile petri plates. The plates were incubated at 25 ± 1°C for 48 hrs. The individual yeast colonies were restreaked on YMPG agar for purification. The cultures were then grown on YMPG agar slants and stored at 4°C for studying the morphological and biochemical characteristics.

Morphological characteristics viz., shape of vegetative cells and budding were studied by lactophenol cotton blue stain, ascospore formation (by using induced spore forming acetate agar medium) with the help of melachite green stain (Kleyn, 1954) and capsule formation by nigrosine stain. Corn meal agar was used for growing the hyphae using slide culture technique (Bernhardt, 1946). Biochemical characteristics were studied by sugar fermentation for acid and gas production (Wickerham, 1951) and assimilation of various carbon compounds (Kreger-van Rij, 1984).

The procedure (Wickerham and Burton, 1948; Wickerham, 1951; Lodder and Kreger-vanRij, 1952) for determining the growth of yeasts was modified, in that the growth was measured Spectrophotometrically in terms of absorbance. The details are delineated as follows: the assimilation of various carbon compounds viz., citrate, cellobiose, trehalose, lactose, L-arabinose, L-rhamnose, maltose, raffinose, sucrose, D-xylose, D-mannose and galactose was studied using the yeast nitrogen broth (PH 4.5). Five ml of the broth was transferred to each test tube and sterilized. Five per cent solution of all sugars except raffinose (10% w/v) were prepared by filter sterilization. Half ml of individual sugar solution was added to basal medium and inoculated with 0.5 ml of yeast culture which was prepared by transferring 48 h old yeast culture to 4.5 ml sterile distilled water. The tubes were incubated at 25 ± 1°C for 3 days and the absorbance read at 740 nm on spectronic - 2 against control blank devoid of carbon source. The method of Al - Doory (1980) was followed for the test of urease production by yeast isolates.

Results and Discussion

Morphological characteristics of various yeasts revealed that they were non-capsulated and without ascospore formation thereby ruling out the possibility of their relationship to the genus **Cryptococcus** and members of ascomycetous fungi. All the yeast isolates exhibited pseudomycelia formation on corn meal agar medium. The isolates were positive for blastospore and arthrospore formation. Thus, one could assume their relationship to the group of fungi imperfecti. Only one isolate exhibited carotenoid pigment production thereby indicating that it belonged to **Rhodotorula** genus.

Table-1 presents the sugar fermentation pattern of yeast isolates and also the assimilations of various carbon compounds as observed by the absorbance measurements. No yeast isolates was found to ferment lactose and starch. Almost all isolates produced acid irrespective of type of sugar fermented. The rate and extent of acid production was variable in case of different yeast isolates. But the gas production ability was not uniform with respect to yeast species and test sugar. However, the yeasts species isolated from gurhal, rose and inner surfaces of apple, did not show any detectable quantity of gas production. In general, galactose was assimilated by all yeasts while citrate, cellobiose, trehalose, maltose, sucrose, xylose and mannose were metabolized by most of the isolates but not by all. However, urea hydrolysis was exhibited only by the yeast species isolated from the petals of rose while rest of the species were negative for this test.

The yeast isolates were identified on the basis of morphological and biochemical tests according to the scheme of Kreger-Van Rij (1984) as **Trichosporon ariense, Trich. melibiosaceum, Candida versatilis, C. intermedia, C. maltosa, C. silvicultrix, C. oleophila, C. buinensis, Candida spp. and Rhodotorula funisanensis. Trichosporon** spp. were present only on the ventral surface of gurhal flower petals and inner surface of apple peels. However, **Rhodotorula** sp, could be isolated only from the petals of rose flower. In general, **Candida** spp. were predominating in all the samples examined. The types of yeasts isolated from different surfaces of the source materials were not necessarily the same. For instance, **Candida oleophila** was present on the outer, while **Trichosporon melibiosaceum** was isolated from the inner surfaces of the apple peel. **Candida buinensis** was isolated form dahi sample and this yeast species was uncommon for other sources examined. Suzuki **et al.**, (1987) isolated and identified yeasts from fermented food and related materials.. They found that **Candida**

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Table 1. Biochemical characteristics of yeast isolates from different source materials

Source			Fermentation of sugars							Assimilation of carbon												Yeast identified
			Sucrose	Lactose	Galactose	Maltose	Glucose	Raffinose	Starch	Citric acid	Cellobiose	Trehalose	Lactose	L-Arabinose	L-Rhemnose	Maltose	Raffinose	Sucrose	D-xylose	D-mannitol	Galactose	
	Gurhal	Ventral	-	-	-	-	+A/w -G	-	-	+w	+	-	-	-	-	-	-	-	+w	+w	+	Trichosporon eriense
	Toria	Dorsal	-	-	+A/sw -G	+A/sw -G	+A +G/sw	-	-	-	-	+w	-	-	-	+	-	+w	-	-	+	Candida versatillis
Flowers' (petals Surface / nectar)		Dorsal	+A +G/s	-	+A -G	+A -G	+A +G/s	+A +G/s	-	+	+	_	+w	+	+	+	+	+	+	+	+	C. intermedia
		Ventral	+A +G/s	-	+A +G/s	+A +G/s	+A +G/s	-	-	+	+w	+	-	-	-	+	-	+	+	+	+	C. maltosa
		Nectar	-	-	+A/w +G/s	+A/w +G/s	+A +G/s	-	-	+	-	-	-	+w	-	+	-	+w	+w	-	+	Candida spp.
	Rose	Ventral	-	-	-	-	-	-	-	+w	+	-	-	+	-	-	-	-	+w	+	+	Rhodotorula fujisanensis
		Ventral	+A, G/s	-	+A/s -G	+A/s -G	+A +G/s	+A/s +G/sw	-	+	+	+	-	+	-	+	+	+	+	+	+	Candida silvicultrix
	Bread surface	Upper	-	-	-	-	+A	-	-	+	-	+w	-	-	-	+w	+	-	+	+	-	+	Candida spp.
		Lower	+A -G	-	+A/s -G	+A/s -G	+A/sw -G	+A/sw +G/sw	+A/s	-	+	+	+	-	+	-	+	+	+	+	+	+	C. silvicultrix
	Lemon	Outer	+A +G/s	-	+A +G/sw	+A -G	+A +G/s	-	-	+	+	+	-	-	-	+	-	-	+	+	+	C. eleophila
Fruits (peel surface)		Outer	-	-	+A/sw -G	+A/sw -G	+A +G/sw	-	-	+w	-	-	-	-	-	-	-	-	+w	+w	-	+w	Candida spp.
	Apple	Outer	+A +G	-	+A +G	+A +G	+A +G	-	-	+	+w	+	-	-	-	+	-	+	+	+	+	C. eleophila
		Inner	+A -G	-	+A/s -G	+A/s -G	+A/s +G/sw	+A/s	-	+	+	+	-	+	-	+	+	+	+	+	+	Trichosporon melibiosaccum
		Inner	+A -G	-	+A -G	+A -G/s	+A +G/s	+A +G/s	-	+	+	+	-	+	-	+	+	+	+	+	+	Trichosporon melibiosaccum
	Dahi		-	-	+A -G	+A -G	+A +G/s	-	-	+w	-	+	-	-	-	-	-	+w	+w	+w	+w	C. buinensis

+ = positive, - = negative, A = acid, G = gas, sw = slow and weak, s = slow, w - weak

GA_3 For Controlling Peel Senescence in Citrus

by

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The deteriorative processes which naturally terminate the functional life of an organ, organism or other life unit are collectively called "Senescence". In citrus, peel senescence involves development of overripe colour, softening of the peel, hence development of rind disorders which leads to poor shelf life of fruit.

During the years of heavy production, growers are obliged to store fruit on the tree or in cold rooms when the market is saturated with the produce. During this storage period quality of fruit both in terms of colour and firmness of rind should be maintained for better returns in later marketing period.

The colour of citrus peel is important for the aesthetic value as consumers prefer brightly coloured fruits. It is well established that colour changes in ripening fruits are affected by GA_3. In citrus, GA_3 not only affects colour changes but also the firmness of rind both on the tree and in storage.

Effect of GA_3 on colour of peel :

According to Monselise (1979), GA_3 delays peel senescence. It delays degreening, both when it is applied on the tree or after harvest. GA_3 has effect on chloroplast / chromoplast transformations. This is the basis for regreening of fruit when left on the tree after winter. Chlorophyll synthesis is resumed and carotenoids are degraded.

Garcia-Luis **et al.** (1986) found that the effect of GA_3 on chlorophyll retention in Satsuma mandarin peel was linearly related to the Logarithm of its concentration. GA_3 did not delay the onset of chlorophyll degradation but reduced its initial rate.

Garcia-Luis **et al.** (1986) treated Satsuma mandarin fruits with GA_3 and concluded that thirteen days after treatment, the treated fruits had lost 10% of their initial chlorophyll content compared to 18% loss in the untreated controls.

The 18:3 acid (Linolenic acid) is a major fatty acid of glycolipids which are contained mainly in chloroplasts. In a study by Fuh **et al.** (1988), decrease in 18:3 composition was found in glycolipids and also neutral and phospholipids during aging of the rind. The decrease in linolenic acid was parelleled by a loss of chlorophyll.

Aging and senescence of plant tissues are known to be accompanied by a decrease in membrane fluidity. GA_3 maintains the level of 18:3 which will contribute to an increased membrane fluidity. GA_3 delayed a decrease in the 18:3 / 18:2 ratio with a rapid and pronounced increase in 18:3/18:1 ratio. Thus GA_3 will increase membrane fluidity by accelerating stepwise desaturation (18:1 to 18:3 via. 18:2). These observations were recorded in Naruto fruits (**Citrus medioglobosa**).

Effect of GA_3 on firmness of the peel :

Calcium plays an important role in maintaining the integrity of cell membranes and cell walls. Dislocation of 'Ca' and other cations from cell walls and membranes by organic acids was reported by Sasson and Monselise (1977). They observed accumulation of malonic and malic acids at fruit maturity and their increase during storage. The increase of malonic acid was 3 fold. These anions act as chelating agents, dislocate cations ('Ca' and others) from cell walls, causes pectin solubilization and speeding up the process of senescence.

Lewis **et al.** (1967) found that calcium concentration of peel tissue decreased during on tree storage of navel oranges. This decrease in 'Ca' was significantly lower in fruit from trees treated with GA_3.

El-otmani and Coggins (1991) found that GA_3 when used alone or in combination with 2,4-D significantly delayed fruit rind colour development from green to orange for both Clementine Mandarin and Washington Navel orange either on the tree or after harvest. GA_3 treated fruit never reaches an over-ripe colour. Rind resistance to puncture was maintained at higher values with either GA_3 or GA_3 + 2,4-D.

El-otmani **et al.** (1990) reported that GA_3 and GA_3 + 2,4-D significantly delayed rind colour change from green to orange by at least a month for Clementine mandarin and Washington navel orange. The duration of delay was greater for Valencia orange.

El-zeftawi (1980) reported that although GA_3 reduced fruit drop, its main value was in improving rind quality by increasing its resistance to puncture and by delaying the los of chlorophyll in grapefruit. Combined spray of 10 or 20 ppm of GA_3 and 2,4-D retained 40-49% of rind carotenoids even after ter months treatment.

Ferguson **et al.** (1984), while working with grapefruit var. Marsh, concluded that preharvest sprays of GA_3 and 2,4-D extended the grapefruit harvest season by increasing rind puncture force and delaying development of mature colour.

Ferguson **et al.** (1982) studied the preharvest, post harvest and combined pre and post harvest GA_3 and 2, 4-D effect on 'Marsh' seedless grapefruit. They concluded that all the treatments were effective from January to March harvests but preharvest or combination treatments were best for fruits for May harvest in terms of both delaying over ripe peel colour and higher peel puncture resistance.

Kuraoka **et al.** (1977) postulated that aging of peels is delayed or reversed by application of GA_3. The rind softness and development of orange colour associated with fruit ripening are delayed by application of potassium salt of GA_3.

Garcia-Luis **et al.** (1989) found the endogenous GA_3 level to be maximal at the mature-green stage. This coincided with the onset of chlorophyll loss and the peak response to exogenously applied GA_3. The application of GA_3 retarded the loss of endogenous gibberellins of the peel associated with ripening.

The disproportionate effect of applied GA_3 may be explained on the basis that (a) GA_3 is more effective than endogenous gibberellins in the retardation of chlorophyll loss and rind senescence. (b) Endogenous GA's do not have access to the active site(s), which are accessible to exogenously applied GA's.

Compartmentalization plays a central role in the response of plant tissues to growth hormones. Although gibberellins are capable of regulating fruit ripening when applied exogenously, endogenous gibberellins may be in an inactive compartment.

GA_3 application prevented the late peel growth which takes place after the cessation

of pulp growth (Puffiness), allowing on-tree storage of the fruit for more than 2 months after commercial ripening.

From the various experiments conducted regarding peel senescence in different citrus fruits, it can be concluded that the pre and post-harvest application of GA will delay peel senescence. This delay in peel senescence by GA is mainly brought about through the retention of chlorophyll or delayed degradation of chlorophyll, maintaining the firmness of peel and reducing the incidence of peel disorders.

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(Contd. from Page 20)

krusei was the most frequently isolated species from various kinds of test materials. The results of this investigation provide valuable information about yeast flora from different source materials.

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Food and Food Processing Scenario

by

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India with population of over 862 million produces on an average about 180 million tonnes (MT) of food grains, 18 MT of oil seeds, 13 MT legumes, 56.4 MT of milk, 2.3 MT of meat and 3.3 MT of fish per annum, all of which are considered essential. While food grains are just sufficient to meet the basic needs, others fall short of minimum nutritional needs. Several programmes like operation flood for milk and technology mission for oil were initiated to improve the situation.

Value wise production by agriculture, horticulture, livestock, poultry and fisheries account for Rs. 738.27 billion (at 1988 prices) at producers level which increases in value due to handling, storage, processing, primary processing and retailing to around Rs. 1305.01 billion. The importance of agriculture is beyond dispute as it dominates the economic scenario in India. The achievement of self sufficiency in cereal production has enhanced the need to improve the quality of daily diet of the Indian citizen as represented by animal proteins, the major source of which is milk. The past two decades saw an unprecedented increase in milk production touching a record availability of 54.9 MT in year 1990. The estimated production in 1991 was recorded at 56.4 MT.

During the Seventh Plan period, egg and broiler production has registered a compound growth rate of 7.3% and 18% respectively. The production in 1990-91 was 21.1 billion eggs and in year 1991-92 it was estimated at 22 billion. This has resulted in less dependence on imported grade parent stock and efforts have paid in improvement in high egg productivity and meat type birds.

The production of food and fermentation products as reported by DGTD report 1990, 41 is shown in Table. It is observed that all the items indicated have shown consistent growth during the year 1990. The production of food and other commodities like oil seed have touched a record level of 18.46 million tonnes with rapeseed, mustard, sun flower and soya bean reaching new peaks. The Department of Food has estimated fish production for 1991-92 to touch four million tonnes, recording a five fold increase in last four decades. There has been a quantum jump in export of marine products from the level of Rs. 8940 million in 1990-91 to Rs. 15000 million in 1991-92 accounting for a spectacular increase of about 68 percent.

Similarly, the production of fruit and vegetables has been estimated to be 28 million and 57.8 million tonnes respectively during the year, while the production of spices went upto an all time high around 2.08 million tonnes. The production of pulses has increased from 10.96 million in year 1987 tonnes to 14.07 million tonnes during the year.

The export of spices from the country during 1991-92 touched all time high mark of 130,567 metric tonnes worth Rs. 3620.4 million as compared to export of 97,291 metric tonnes valued at Rs. 2836.7 million in the previous year. Interestingly during 1991-92 India's share in the global markets of spices reached around 33% with global trade estimated to be around 4,00,000 tonnes by International Trade Centre, Geneva.

The total export of spice oils and oleo resins in 1991-92 were of the order of Rs. 56 crores, of this 60% of the exports were to the United States.

Food of various kinds like vegetables, milk, fish, eggs, legumes, oilseeds, fruits and other products are main source of Agro food industry. Many of these products are processed before they can be consumed. Food processing is an age old industry as this was the only technique adopted to convert raw food into edible food. Nearly Rs. 62,000 crores worth of Agro foods are converted annually into processed foods. Food industry developed on a large scale to handle and process large volumes of a variety of foods. The raw foods have to be processed in bulk before they could be marketed in consumer packs and preferences. Food industry is the largest determinant of GNP in our country and it is the largest employer. About 19% of the total industrial output comes from food processing industry. The food processing industry has grown since the last 10-15 years.

Inspite of vast agro based industry, only 12% of the raw material is being processed by the industry as against 64% in the U. S. A. At present Indian food processing industry faces both external and internal constraints. External constraints include cost disadvantages in the international market while internal constraints comprise lack of suitable technology, infrastructure, storage and marketing. The Government is supporting the food processing industry with various forms of incentives to promote marketing the processed foods in the export market.

With the delicensing of food industry and liberalised conditions for technology transfer, investment, co-operation and collaboration there has been a boom in the emergence of packed food products in India in last 10 years. In order to encourage the development of this industry Rs. 1200 crores have been earmarked as the target for the export of processed food including marine products during 1992-93 and approximately Rs. 700 crores have been allocated in the 8th Five Year Plan for project assistance and building up of infrastructure for the food processing units. It is also suggested that all controls on export and import trade would be removed in phased manner during this year.

Processed Food Industry includes biscuits, bakery products, confectionery, meat and fish processing, canning and processing of fruit and vegetables, dairy products, starch and malt based products etc. This industry has high level of employment potential and a lower level of investments. It employs about 20% of the total organised work force and with roughly 19% of the total factories in the country, it produces about 16% of the total industrial output.

Nearly Rs. 61,000 crores worth of Agro foods are converted annually into processed foods. The gross national product is a parameter to indicate the overall status of a country. It accounts for less than 7% of the gross investment in the industrial sector input and fifth in terms of contribution to value addition.

The estimate for 1995 has been drawn on a very objective note. The table indicates the projected demand which clearly envisages

he requirement of the processed foods in coming years.

Sector	Projected Demand-1995 (Lakh Tonnes)
Bakery Products	34.00
Confectionery	0.37
Fruit & Vegetables Products	7.17
Chocolate	0.29
Dairy Products	4.2
Weaning food	0.25
Soft drinks (Million bottles)	0.17
Beer (KL)	4.27
Instant Coffee	0.20
Marine Products	2.50
Paste Goods	0.45
Sweets / Snacks	7.20
Spice Powders	0.36
Vermicelli	0.97
Meat Products	1.51
Starch & Derivatives	3.16

Some sectors of the processed food industry are being discussed in the coming pages to give a brief idea about their status.

Milk And Milk Products :

India ranks 3rd in the world in milk production out of which about 30 percent is converted into milk product of which butter and ghee are major components. The table below indicate the percentage utilisation of milk for various products from 1951 to 1986.

Sl. No.	Product	1951 (%)	1986 (%)
1.	Liquid Milk	39.3	46.0
2.	Milk Powder	-	36.0
3.	Ghee & Butter	45.3	34.5
4.	Khoa	4.4	5.5
5.	Cream	0.5	0.5
6.	Curd	8.8	7.0
7.	Ice Cream	0.7	0.7
8.	Cheese	-	2.0
9.	Others	0.4	0.2

U.S.A.	67.4
India	56.4
EEC	103.4
USSR	96.4

As can be seen from Table above, India is marching on to going ahead of the U.S.A in milk production. The last two figures are of common pooled and not of individual countries.

Milk accounts for more than 17% percent of Indian Agricultural production against 14% in year 1971. This is made possible by four "Operation Flood Projects" launched by the Government. Milk production almost doubled from 28.4 million tonnes in 1977-78 to 45.9 million tonnes in 1987-88. This has gone up to 56.4 million tonnes in 1991-92. By the year 2000 AD total milk production in the country is expected to go up by 65 million tonnes.

The production in the organised sector/ co-operative sector in year 1986-87 was 15000 tonnes of butter and 27000 tonnes of ghee. Production of other milk products which is mostly undertaken by large scale units has grown rapidly in recent years. There are over 300 dairy plants with daily average milk handling capacity of 12.80 million litres. Number of new plants are coming up after the Government delicensed the Dairy Industry in the year 1990. The Government introduced MMPO in the year 1992 to check the inflow of Private Sector organisation going into this industrial sector. MMPO has now granted that private entrepreneurs interested in establishing milk process unit can do so with a handling capacity of 75,000 L.P.D. with the concurance of the state government. Based on the apparent consumption of various milk products, demand has been calculated for the year 1995 and 2000 as 29.8 million tonnes and 33.8 million tonnes respectively. Share of milk products has been kept at 52% of the total milk production.

The consumption of milk and milk products (1989-90) is shown in the table below :

Product	Consumption '000 MT
Liquid Milk	23,460
Butter Milk	17,600
Dahi (Curds)	35,700
Butter	210
Ghee	710
Cream	13
Paneer and cheese	153
Khoa and Condensed milk	700
Milk powder including infant milk food	165
Ice Cream	40

The production of milk as well as its utilisation is increasing and it is clear from the above table that the growth in products like ghee, ice-cream and butter and paneer/ cheese is increasing.

The gross value of the output of milk and its products at current prices has more than trebled during the last decade to about Rs. 8000 crores. The product factories showed

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improvement in capacity utilisation from 62.5% to 79.2%. The increase of 15% utilisation gave improvement in product availability. Today, the country has attained self reliance in dairy equipment giving boost to this industry. Most of the Indian population is vegetarian giving rise to higher consumption of milk and milk products which make it very indispensible.

Biscuit and Bakery Products :

Bakery products contribute to approx. Rs. 2000 crores of processed food in India. Today, biscuits, cookies and buns have become commonplace consumption items. Bread has now become part of the urban population food habit. There are 36 units in the Organised Sector and production in 1988 was placed at Rs. 141 million tonnes against the installed capacity of 152 million tonnes. It is estimated that production in the unorganised Sector is almost twice this. On this assumption the production is estimated at 423 million tonnes. Further growth of this industry has been reserved for small scale sector. This has led to job work system. Many small scale industries have been indirectly established by large companies to increase their turnover and also pay for less manufacturing costs. This has deprived the customers from getting good quality biscuits as available in the international market due to poor quality of plant and machinery.

The production of bread has been reported to be 129 million tonnes in the year 1988. The growth is consistent in Urban cities. The estimated demand for 1995 has been kept at 14.0 lakh tonnes which guarartees 80% of capacity utilisation. The consumption of biscuit has been broadly confined to Glucose and low sweet type biscuits. The other varieties have less demand. M/s. Britannia Industries Limited has been providing new varients only for higher income groups.

Table below indicates percentage demand for various types of biscuit on all India basis.

Volume Share	Percentage
Glucose	35
Low Count Sweet	28
Hard Dough (Marie)	21
Low Count Salted	10
High Count Salted	2
High Count Sweet	2
Others	2

The export of biscuits has been confined to Bahrain, Ethopia, Kuwait, Maldives, Nepal, Gulf countries, Seychelles, Singapore, Somalia, Srilanka, USSR etc. During 1986-87 a quantity of 1182 tonnes of biscuits were exported to the above mentioned countries. aThe total export in terms of value was Rs. 139 lakh during 1987-88 and value for different products stood at Rs. 226 lakh during the year. The export demand would increase provided quality biscuits are manufactured comparable to international standards.

Convenience foods :

Instant convenience food market has come to stay in India. The convenience food market is estimated at Rs. 4,000 crores. The sector is showing growth of 10-12%. If the number of units is any indicator there are approximately 350 units registered and many of them are operational. There are about 54 snack food units which is another indicator of this vast potential market segment in our country.

Convenience foods include the following categories :

1. Convenience Snack Mixes
2. Instant Noodles
3. Texturised Vegetable Proteins
4. Masala Mixes
5. Breakfast Cereals
6. RTE Snack Food
7. Protein Foods
8. Precooked Non Veg. Foods
9. Retort Pack Foods

The convenience food market started as early as 1963-64 with introduction of various instant mixes developed by C. F. T. R. I., Mysore and manufactured by Gits Food Products, Pune.

These foods showed very little acceptance initially as the products were compared with the products manufactured by traditional technologies. Many enterpreneurs tried different products with various trendy pack formulations. The acceptance of such products was very little. Convenience food took a leap with introduction of Two Minutes Noodle by Nestle. Score of others are getting into this market segment. Packed snack food and Retort pack food are the latest in this field. Retort pack food introduced by Tasty Bite have been confined only to metro markets, whereas snack food like Ready fry snack, fried snacks, potato wafers have made inroads in the rural markets also. Nearly everybody in the food sector is a player in this field. Host of industries are planning their launches in this area. The most successful players in this field have been Amrit Agro and SM Foods. Their products have been well accepted and are major players in fried snack market, followed by Jagjit Industries, Pepsi Foods and Duncan to name a few.

The approximate market for snack food in the country is estimated at 300 cror is the city segment of the urban popula which is providing the main consumer tion for extruded snack food market. convenience to carry and eat, the attrac look, catchy packaging contribute to response of city consumers. Being a r entrant as snack food it is not possibl estimate an accurate segmentwise consur tion structure for snack foods. However envisaged structure is given below :-

Product	Market	Consu-mption	Consu-mer	Con mpti
Extruded	City	60%	Children	60%
Snack	Towns	30%	Adults	40%
Food	Suburbs	10%	-	
	Villages	Nil		

At present there are 5 units in Organise Sector of RTE extruded foods with installe capacity of 33,400 tonnes. Production of i stant snack food in the year 1990-91 stands 9356 tonnes. It has doubled from 1984.

The export of snack food including thos of cereal preparations and other prepara tions of flour meal and other breakfast foo touch a total of 17065 tonnes earning a tota of Rs. 828 lakh in Foreign Exchange.

Consumption trends of various snack food in the past go a long way to determin the future demand of various snack foods, convenience foods. Production of potatoes has increased from 5 million tonnes to 16 million tonnes in 1987-88. India is exporting mashed potatoes and other products based on potato. The raw potato are being exported to Gulf Countries for manufacture of snacks. The demand for vermicelli, noodles etc. in domestic market is even increasing. All the units like Savorit, True, Bambino, trade brand names are selling their full capacities, vermicelli 'short cut' is in great demand for preparation of various convenient Indian dishes like Kheer, Upma etc. The total supply of this production from organised sector is estimated 5000 tonnes per month. Since 1987, 38 industrial licenses have been issued. Among them the items include, instant noodles, extruded snack products, diet foods, macarsoni, instant rice, snack products based on cereals, corn flakes, puffed wheat, expanded rice crisps, french fries, puffed maize etc. The domestic consumption of these products is likely to exceed 2.0 lakh tonnes by the end of 8th plan.

The new industrial policy has been boon to some, anathema for others. The food processing industry/units other than milk food malted foods and flours have been given exalted appeal. They have been placed in the category of high priority industries, eligible for automatic approval of foreign technology

agreement with 51% of foreign equity approvals. Indian food processing industry is now witness to a mad rush of new entrants. Kellogs would hit the market in 1994 with breakfast cereals. McDonalds the hamburger giant, with its 13,000 outlet worldwide now adding vegetarian delights.

Soups :

The growth of convenience foods has been confined to some categories like fruit juices, tomato products and noodles. In our country liquid food has been recommended since ages. It is paradoxical that soups do not find a place in our daily diet. In South India, Rasam is consumed daily as a routine, without which a meal is supposed to be incomplete. The introduction of soups from Bits, Maggi and others have shown slight acceptance but need to be marketed with more thrust and imagination. Food habits in India are such that the need for soup gets depressed, as generally vegetables are cooked with curries, which is not a habit abroad. However, soup based on carrots, tomatoes, chicken etc. is receiving an encouraging response. The demand in cities is estimated around 400 tonnes under restricted consumption.

Chocolate and Confectionery :

Confectionery include toffees, candies, peppermint, chocolates and lozenges. There are almost 500 small scale unit and cottage scale industries in India. Presently there are 12 units in Organised Sector. The cottage industry and small scale unit normally cater to villages and small town markets. The Organised Sector presence is felt in urban and larger town markets. The confectionery industry has consistently over a period increased their production from 23.75 thousand tonnes to 27 thousand tonnes recorded in 1987-88. The chocolate and chocolate products have six units in Organised Sector. The capacity utilisation has increased from 78% to 91% in five years. The highest utilisation was recorded in 1987-88. The total production in the same calender year has been recorded as 7700 T. and for the year 1988-89 it stood at 9240 T which has increased to 10321 T for the year 1989-90. Installed capacity in Organised Sector have remained consistent. The demand for confectionery items is steadily increasing.

In India chocolates were initially consumed by Foreign visitors or by upper middle class of society. With improved living standards the demand for chocolate is increasing by 15-20% every year. The total production is estimated at 8200 tonnes p. a. Cadbury Fry is the undisputed leader in chocolate market. Other producers like Amul, Dr. Writers and Campco (now market under Nestle brand) hold the remaining of the market share.

The major manufacturers in the organised sector are Nutrine, Ravalgaon, Parle, Parrys, Morton and others. The total tonnage produced per annum is to the tune of 90000 tonnes: Nutrine holds approximately 30% of the market share followed by Parle with 28% and Parrys with 20%. The others contribute 22%. Ravalgaon and Morton each hold approx. 6% of the market sales.

The export sale of confectionery and chocolate has been very little as compared to the domestic consumption. The domestic market for confectionery alone is estimated at 100 crores. Export of confectionery goods has not been more than 50 lakh per annum. Most of the products are sold in the Gulf, Nepal, Srilanka etc. The demand in 1995 is placed at 1,20,900 tonnes. Additional capacity required in 1995 would be around 60,000 tonnes.

Fruit And Vegetables

In the world, India ranks second to Brazil in production of fruit and next to China in vegetables. India produces 63.90 percent of world's mango, 11.49 percent of world's banana and 11.72 percent of world's onion.

	Fruit & Vegetables In (000 Tonnes)	
	Total F & V	Fruits
China	1,18,394	13,623
India	73,483	24,767
U. S. A.	49,605	22,906
Brazil	30,633	25,529
World	7,39,907	3,25,806

Due to increase in income, people are slowly shifting to the use of more fruits, processed foods etc. from grains and cereals. Considering the perishable nature of the fruit and vegetable, it is important to have more processing units to preserve fruits. There are very few units which are processing fruit and vegetables. Very recently processed peas were introduced by MAFCO. A contineous plant was first commissioned by Tasty Bite to process peas and other vegetables by IQF system. The National Dairy Development Board took up the cue and set up a massive plant for processing vegetables. Earlier, these plants' vegetables were batch processed and canned for export market. Very little domestic market was available for such products due to heavy cost of packaging. The vegetables are now available in polybags throughout the year in cosmopolitan cities. In towns and rural areas there is much room for growth. Another vegetable which is being processed on a large scale for domestic market as well as export are mushrooms. Lipton and Flex industries have already gone into the business. Each has set up units capable of

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producing 2000 tonnes per annum of packed processed mushrooms.

The Table below gives a brief on vegetable and fruit production statewise separately.

Vegetables

States	Tonnes
Maharashtra	8,29,592
Uttar Pradesh	1,00,45,560
Orissa	57,10,000
Kerala	33,50,708
Karnataka	35,32,956
Bihar	77,00,936
West Bengal	39,64,617

All other States produce 578 lakh tonnes of vegetable which is quite large.

Fruits

States	Tonnes
Jammu & Kashmir	388.4
Himachal Pradesh	133.4
Uttar Pradesh	2545.0
Bihar	2856.9
Maharashtra	1509.1
Karnataka	2082.8
Kerala	2251.8
Andhra Pradesh	2297.7

The total production of fruits from all states is approx. 280 lakh. tonnes. The major fruits from the above states are Mangoes, Banana, Chikoo, Apples etc. Jammu & Kashmir, Himachal Pradesh are two states which dominate in apple production.

Uttar Pradesh, Maharashtra, Karnataka and Andhra Pradesh are growers of various varieties of mangoes.

The export potential of fruit of this country has been low as compared to other countries of the world. This is because of poor transport and poor storage facilities. Mangoes have been exported as the largest fruit from this country. India contributes about 15% of Mango exports in the world. Other fruits from this country exported are much less due to poor transportation system and better quality of products available in other countries. Grapes follow suit in export business of fruits. Maharashtra has been cultivating grapes for export purposes as well as for certain kinds of wine production. Government has given large incentives to promote fruit and vegetable processing industry. In the year 1992 Temptation Foods and Salstar Industries were set up to process fruit and vegetable to the tune of 6000 tonnes per annum. Temptation Foods has been set up as 100% buy back E. O. U. It is expected to export 4000 tonnes of processed fruit and vegetables.

India's food processing industry has annual turnover of Rs. 20,000 crores. Indian exports stands at Rs. 120 crores in year 1991-92.

International trade in processed fruit and vegetables alone is about $ 7 billion (Rs. 21,000 crores). India exports a meagre Rs. 317 crores of fresh fruits, vegetables and onions and about 120 crores of processed food items. It is obvious that India has the potential to become an exporter with some significant presence. No doubt marketing globally is another hurdle as there are very big players in the field. Facilities are falling short of production capabilities. An investment in harvesting technology, cold storage facilities and refrigerated transport could help save much of the Rs. 3,000 crores worth of fruit and vegetable which do not reach consumers. Additional incentives for such a sector is a necessity. It is estimated that as much as 35 to 40% of the retail price of processed item comprises Government levies. With improved varieties and removal of above mentioned constraints, India will be a force in the international trade.

To add to this boom, Cocacola has plans to export processed food from India, such as Eta nuts and Planters stackable Potato chips. Added to this, the Government plans to set up 250 food processing centers in 8th Plan giving rise to Rs. 25,000 crore turnover per annum.

Meat And Poultry :

The live stock population is over 600 million according to 1987 census. There are 2800 municipal slaughter houses in this country. Most of these slaughter houses have very less facilities for production of hygienic meat. The production of meat products has increased from 18000 tonnes in 1984 to 23000 tonnes in the year 1988. About 45 million sheep and goat, 2 million cattles including buffalo and 1 million pigs are slaughtered annually in various parts of the country. The estimated domestic consumption in 1986-87 was placed at 4.38 million tonnes. This leaves an export surplus of about 60000 tonnes. The export of meat is relatively small. Recently, AlKabeer have set up new IQF system for processing meat and are exporting small quantities to Gulf countries. The export of meat has gone up from 5500 tonnes in 1980 to 9500 tonnes in 1987, which is approximately valued at Rs. 7568.19 lakh. The export of meat in year 1987-88 has shown an increase in value to the tune of Rs. 2000 lakh. Bulk of the export Cold Storage Pvt. Ltd., A. Kalvert & Co., Bacon Factory, Poultry Dressing Plant, Pune, Venkys Hatcheries and host of other units.

The poultry sector has been assuming importance in recent years. Brand names like Venkys, Agritech, AlKabeer, Mafco, lazeez have become household names. However, this market has long way to go before it comes into its own.

During last three decades poultry industry has made tremendous progress. It has produced 1700 crores eggs, and 12 crore broilers in 1988-89. Processed chicken and other chicken products have shown increase interest with customers. This is seen by growth of Venky's and Agritech processing units.

To add to this growth, Tatum Farms of America is setting up an ambitious Rs. 492 crore project : cold storage units outside six major cities to supply frozen chicken.

Growth of Poultry In India

Particular	Year 1991 (in Million)
Broiler Population	250
Layer Population	125
Desi Layer	15
Improved Layer	110
Total Egg production	27,000
Value of Poultry products	30,000

Eight bacon factories and pork processing plants were established during the 4th Five Year Plan in Uttar Pradesh, Andhra Pradesh, Maharashtra, West Bengal, Punjab, Bihar, Rajasthan and Kerala. The pig industry has to grow in future to ensure remunerative prices for pig growers.

The other products like beer, marine products have been left out as the author is not well versed in these products. The data collected has been inadequate, hence could not be made a part of this paper. From the report of Department of Agriculture, it is stated that fish production during 1991-92 is likely to attain all time high level of 4 million tonnes. There has been a quantum jump in export from 894 crores in year 1990-91 to the level of Rs. 1500 crores in 1991-92.

It could be seen from the details and data that food processing industry has tremendous future in years to come and shall be a lead industry in India.

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Fermentation Technology

Most distillers use a strain of brewer's yeast, *Saccharomyces cerevisiae*, of which there are many. The sort of yeast brewers use is crucial, because the microorganisms do more than just produce alcohol from molasses. All yeasts produce alcohol in the same way, by fermenting sugars via the "glycolytic pathway". But different strains vary in the extent to which they make particular chemicals as they grow in the medium. Distillers the world over, particularly after the advent to methods of genetic engineering and biotechnology, are in search of alcohol producing yeast strains.

Recombinant - DNA technology now enables biologists to bypass the difficulties of classical strain breeding techniques. Over the past 15 years, researchers have produced "plasmid vectors" that can introduce a new DNA that is stable so that it enhances the desired feature - e.g. increases the yield.

The total current production of ethanol in the country is about 1200 million litre per year. This still leaves a big gap between demand and production. In India, ethanol is produced exclusively from sugarcane molasses, which is a byproduct of the sugar industry. Distilleries, in general, start with molasses diluted to 15-20% sugar concentration and get 6-7% ethanol after 22-32 hours of yeast fermentation. During summer months efficiency is reduced. Since higher yield from modernising plant equipment calls for major capital investment, use of a higher yielding strain becomes an attractive proposition.

The IMT programme called Energy Efficient High Alcohol Yeast (EEHAY) technology began in 1986-87 as a department of biotechnology R & D project. By 1988, a pilot scale process had been developed to handle a 4000 litre fermenter - a level that was within the wherewithal of IMT (Institute of Microbial Technology). The IMT strain, called MTCC 181, was found to grow in 50 per cent molasses (35 per cent sugar) concentration. The parent strain is known not to grow in such high concentration of molasses. Temperatures upto 35°C was found not to affect the efficiency. It was also found that the yeast cells could be recycled upto 4 times without efficiency degradation. In the 4000 litre fermenter, the strain gave 14 per cent alcohol in 45 hours at 90 per cent efficiency.

The Council of Scientific and Industrial Research (CSIR) licensed the lab scale technology to Vittal Mallya Scientific Research Foundation (VMSRF), Bangalore, whose parent group owns the McDowell & Co. chain of distilleries, for upgrading it to commercial scale. Unlike the AIDA (All India Distilleries Association) the VMSRF was positively disposed to collaborating as an equal partner with the CSIR. This collaboration achieved a breakthrough in developing a strain that yielded 12-14% alcohol from high sugar concentrations in the range of 20-24% at 87-90 per cent efficiency. With this strain the productivity per tonne of molasses is expected to increase to 245 litre as compared to the prevailing 200 litre industry norm.

The major benefit is in saving steam consumption of between 0.7 to 1.0 kg/l of alcohol. In a typical factory of 30,000 litre per day capacity, with a steam cost of 50 paise/kg, a saving of more than Rs 40 lakh per annum is achieved in energy/fuel costs alone. The other benefit is reduced effluent volume.

The conditions of technology transfer that the IMT-VMSRF has set forth are actually quite reasonable. The licence fee ranges between Rs 10 and 30 lakh, per distillery depending on its size, less than a third of what one would pay internationally. There is also a substantial concession in the licence fee for those companies which have more than one distillery. Eighty per cent of the Indian distilleries, cannot afford to invest in modernisation and, therefore, the IMT process is ideally suited to batch processes of such distilleries, says Dr. Basu, director of IMT. All that a distillery has to invest in is installing heat exchangers, pumps, piping etc. required for high gravity fermentation that high sugar concentration molasses entails.

According to IMT-VMSRF estimates, the total investment, including the cost of technology, will be paid back by the savings in fuel cost alone in a period of one year.

Already 5 distilleries of McDowell & Co., with a total production capacity of 64,0001/day have taken the technology at a total cost of Rs 81 lakh. The company expects a total annual steam saving of Rs 6,120,000. One factory operating in South India at a capacity of 11,0001/day, has been able to increase its yield to 10 per cent and the saving of steam has been found to be 0.8 kg/1.

The situation, however, would have been far more encouraging for the CSIR if all the distilleries perceived the benefit that lies in opting for IMT-VMSRF technology, especially when the CSIR is putting its best foot forward to forge better lab-industry linkages.

ERRATA

With reference to the article **"Utilization of Fruit Industries Waste"** by Dr. (Mrs). Neelima Garg, Dr. D. K. Tandon and Dr. S. K. Kalra, in the January '94 Annual Number of "Beverage & Food World", the bibliography was erroneously arranged alphabetically. We give below the correct sequential order cited according to text and regret any confusion that may have arisen as a result of the alphabetical arrangement.

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NEWS & NOTES

TAX RELIEF ON SOFT DRINKS, FRUIT JUICES

The Centre has instructed all the State chief ministers to give tax relief on soft drinks and fruit juice.

Mr Tarun Gogoi, Union food processing industries minister said recently that the exports of food processing industries of the country had increased and it was about Rs 4,000 crores during 1993-94 against Rs 3,000 crore in the previous year.

Speaking about the north eastern states, the minister said though the industries were slowly picking up, the industrialists from outside states were still hesitant to come to Assam because of two contraints - power and law and order situation. The centre had requested the state government to improve the power position, he said.

Replying to a question, Mr Gogoi said his ministry had sanctioned about Rs 17.2 million for 1993-94 against Rs 250,000 lakh in the previous year to Assam. He also sanctioned Rs 14.02 million for 1993-94 to Mizoram against Rs 11.3 million in 1992-93 and Rs 3.4 million to Nagaland for 1993-94 against Rs 75,000 in 1992-93 to setup food processing industries, he said.

The minister said the tea companies including Assam tea companies, were eager to set up food processing industries.

Reacting to the opposition parties allegations that India had signed the GATT accord under the pressure of IMF, Mr Gogoi said the allegations were baseless and politically motivated.

FOOD FLAVOURS CAN HAVE NUTRITIONAL IMPLICATIONS

The browny crust of baked bread, the characteristic flavour of roasted peanuts or the aroma of roasted coffee beans may be welcome from a gourmet's point of view, but the chemical reaction that confers these flavours and tastes has medical and nutritional implications, according to a report.

A chemical reaction called Maillard reaction that takes place between amino compounds and reducing sugars gives the distinctive flavour and colour to many foods, but can also lead to cataract formation in diabetics and rob the body of some essential amino acids contained in foods.

Maillard reaction, which occurs in almost all foods, especially those whose processing involves heat, and in living systems, has some positive and negative effects, says a report in the Journal of Scientific and Industrial Research.

The reaction is a boon to the food process-

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ing industry which uses specific combinations of amino acids and sugars to give distinctive meat, coffee, roasted peanuts or chocolate aroma and colour to foods.

But the formation of maillard reaction products in food stuffs can sometimes result in loss of nutritional value because of inactivation of amino acids, the report warns.

For example, lactose reacts with the essential amino acid lysine in ultra-high temperature (UHT) processed milk, making lysine unavailable to humans.

Since the reaction alters amino acids, and thereby proteins, in the presence of reducing sugars such as glucose, it causes problems in diabetics who have excess glucose in their blood, the report says.

In chronic diabetics, crystallins, which are structural proteins of the eye lens, undergo maillard reaction, leading usually to cataract of the eyes.

Maillard reaction also affects proteins of connective tissues such as collagens.

The role of Maillard reaction products in cancer formation and inhibition is also a point of debate. Researchers speculate that any anti-cancer activity associated with maillard reaction products could be due to their anti-oxidative properties.

The report says complete absence of maillard reaction products too is not desirable, as is the case with microwave heating. Although the method leads to quick and uniform heating of food, it has its limitations. The food gets cooked before the maillard reaction gets underway, resulting in loss of flavour and taste of the food. The problem can be somewhat solved by adding maillard reaction agents, especially in airline caterers, convenience food manufacturers and five-star hotels.

Several patents exist for processes which exploit maillard reaction to produce the desired flavours and shades.

Specific combinations of maillard reaction agents are added to icing inks consisting of fructose, monosodium glutamate and water to form letters and drawings on baked foods by heat processing; during microwave heating to give brown crust to baked products; to make brown fish paste from ground shell fish or to impart dark brown chocolate-like colours, or roasted coffee or peanut flavours to certain foods.

Certain amino acids give rise to distinct aromas — for example, cysteine, glycine, glutamic acid, methionine and histidine give rise to meat aroma; while phenyl alanine can give rise to honey flavour.

Similarly, researchers have identified the specific amino acids responsible for the flavour of bread crusts, aroma of roasted coffee, or roasted palm kernels.

The secondary steps in the maillard reaction leads to flavour formation, while the brown colour is due to the formation of compounds called melanoidins, high molecular weight complex polymers formed in the last stages. of the maillard reaction.

The browning reaction is affected by several factors such as temperature, ph, types of sugars and amines taking part in the reaction, moisture content, sulphur dioxide and phosphates.

Researchers have reported that in the presence of sugars lysine and glycine had high browning rates, cycteine and methionine had intermediate browing rates and glutamine, valine and typtophan had low browing rates.

FLAVOUR CAPSULES

Flavour is an essential quality in food. But because the spice oils and oleoresins currently used by the food processing industry in India are highly viscous and concentrated. It is difficult to disperse them uniformly in the food. Also, some flavour is lost during processing.

A new technology promises to reduce flavour loss and achieve stability and uniform distribution of flavours in processed foods, by encapsulating the flavour components - solids, liquids or gases in minute, sealed capsules.

Encapsulation has many advantages. It is concentrated, hygienic, easy to pack and transport, and above all, it 'locks in' the flavour on dry mixes till the product is exposed to moisture.

While several encapsulating techniques are available, the Central Food Technological Research Institute, Mysore, has standardised the Spray-drying technique to encapsulate spice oils and oleoresins. The process. which consists of two steps - preparation of the flavour emulsion and dehydration - is ready for commercial exploitation.

The encapsulated flavour powder can be used in variety of products, like dry beverage mixes, cake mixes, infant deserts, ice cream mixes, soup mixes, savoury dishes, seasonings, spice mixes and dusting on potato chips, nuts and snack foods.

NEED TO DEVELOP FOOD PROCESSING METHODS STRESSED

The country is losing nearly 40 per cent of perishable commodities like vegetables, fruits and fish and upto 10 per cent of grains produced, due to inadequate and antiquated food storage, processing, and preservation facilities, according to University of Agricultural Sciences Vice Chancellor Dr. K. V. Devaraj.

Inaugurating a seminar on "Nutritional Aspects of Food Processing for Home and Market" in February, he underlined the need to develop suitable the need to develop suitable methods of food processing and storage to prevent such colossal losses.

In developed conuntries like the US and the UK, about 80 to 85 per cent of all raw food were made to undergo some degree of processing before consumption. Against this, in developing countries only about 10 to 15 per cent of all raw food were processed. This figure was particularly dismal for India where only two per cent of the foods were being processed, he pointed out.

However, the popularity and demand for such processed and partially cooked foods was gradually rising in the country as more women were taking up careers outside home and resorting to these foods to save time in the kitchen. Faster urbanisation and the breakup of the joint family were also contributing factors to this phenomenon, he said.

He released a book " Soyabean in Health and Diseases" by M P Vaidehi of UAS on the occasion.

65% BOTTLED MINERAL WATER UNSAFE: STUDY

About 65 per cent of all bottled mineral water sold in India is unsafe for drinking, according to a report by the Shriram Institute for Industrial Research a few months ago. The report mentions that tests had been conducted on 14 brands. According to the report, exports of this fledgling industry are low, except to West Asia, due to poor quality control and high freight costs.

"It has been studied that 65 per cent of such waters do not comply with one or more value as prescribed for the drinking water standards. It is no wonder that the water at the tap is better off for drinking than the purchased bottle," says the report. The small bottle mineral water industry has been on a boom growth for the past two to three years and has an estimated market of about Rs 100 crores.

The report mentions that tests were carried out on 14 brands, including Penguin Mineral Water, Amrit Jal, Pondicherry Natural Mineral Water, Solan Spring Natural Water, Himalayan Bliss Ganga Jal, Ajwa Natural Mineral Water, Dew Drops, Bisleri Aqua Mineral, Mr Pik, Mountain Spring Water Aqua, Natural Mineral Water, "Kawther" and Magma-2000. The report does not name any specific brand as unsafe for drinking.

But it says that some of the brands like Penguin Mineral Water and Himalayan Bliss Ganga Jal, there is no mention of the composition of the water except a general statement. "Only in some cases bacteria-free water is claimed which is the most important parameter in any drinking water," says the report.

The report mentions that calcium and magnesium, which are the basic constituents of the mineral water, vary in degree considerably in some of the brands. The Shriram group, which deals with housing and finance, also has a bottled mineral water mineral product with the brand name of Deep Spring, which it had launched in 1991.

FOOD INDUSTRY SEEKS DUTY CUT

The Confederation of Indian Food Trade and Industry (CIFTI) has demanded that the 1994-95 Budget proposals should be rectified to give a boost to the food processing industry.

Addressing a press conference recently, Mr. D. H. Pai Panandiker, Advisor, CIFTI, said that the Budget proposals would yield a revenue to the Central exchequer of Rs. 350 crore. However, they would adversely affect the growth of the industry.

The industry has tremendous potential and the recent growth in exports have been largely due to the spurt in agro-products. The industry also generates substantial employment in rural areas.

Specifically, the customs and excise duties on packaging material for the food processing industry was excessively high and accounted for 50-55 per cent of the cost of production.

There was a strong case for reduction in the rates of excise duty on processed foods like concentrated condensed milk in unit container, chewing gums, tapioca, corn flakes, extruded snack foods, instant coffee, aerated softdrinks, vinegar, vanaspati etc.

Malted milk food and malted food is taxed at a rate of 25 per cent.

ITALY KEEN TO INVEST IN FOOD PROCESSING SECTOR

Italian investors are keen to invest in the Indian food-processing sector, specially in joint ventures in mushroom cultivation and fish and cereal processing.

This was conveyed when the visiting president of the confederation of industries, Dr. Luigi Abete of Italy, met Mr. Tarun Gogoi, minister of state for food processing industries recently.

Leading a high- powered Italian business delegation, Dr Abete proposed setting up a joint working group in collaboration with the Italian Institute of Foreign Trade and Indian Industrial organisations for identifying other potential areas for bilateral cooperation in food processing.

Assuring all government help for investors, Mr Gogoi said India, having vast potential in food, vegetable and fish processing, would like to have Italian technology in machine manufacturing for food processing and the manufacture of pasta.

The Delhi School of Economics and Italian Institute for Foreign Trade signed a memorandum of understanding today to establish and develop channels for exchange of economic and industrial information pertaining to India and Italy.

THEMENDOUS EXPORT POTENTIAL FOR MUSHROOMS

The dark brown morel mushrooms that grow wild in the coniferous hill forests of the Indian states of Himachal Pradesh, Uttar Pradesh and Jammu and Kashmir were until recently a delicacy reserved to the local tribes

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- because only they could tell the poisonous from the edible ones.

But Delhi traders have now changed all that. Realising the tremendous export potential of this delicious fungus they have persuaded the state governments to auction sections of forest land to them, so that they can reap the morels with the help of the tribesmen and export them to the US, Swizerland, Germany and France.

These traders are not alone in eyeing the fast-expanding global market for mushrooms. Keen to encourage agri-busineses, the Indian government is in the process of clearing over 20 joint ventures between Indian and foreign companies to cultivate mushrooms in India, primarily for the export market. The government's Foreign Investment Promotion Board has received investment proposals worth over Rs 290 billion (6.25 billion) for the food processing industry many of them for mushroom cultivation.

Large foreign agri-business companies, including the Dutch giants, Dalsam Veciep, Haegens, and Genssen Kessel, Monterey Mushrooms of the US, and Turatti of Italy have already found Indian partners to set up mushroom cultivations and canning facilities at locations across the country.

Although mushroom farming is comparatively new in India, investors are being attracted by abundant and cheap labour - mushrooms have to be picked and sorted by hand. Compost like chicken manure and paddystraw, which is an essential requirement for mushroom cultivation, is also easily available.

Most companies will cultivate white button mushrooms, which have a world market share of nearly 40 per cent. Though hilly areas provide the best climate for button mushrooms, more and more growers prefer using greenhouses in urban areas, to facilitate transport and distribution. Mushrooms are highly perishable, and the domestic market for them is negligible.

As part of its efforts to boost mushroom exports, the Indian government has approached the European Union for a quota, to save the additional customs duty levied on third-world countries without a quota.

Foreign investors, some of whom have applied for permission to set up as many as five plants in different locations, say that the quality of the mushrooms available in the Indian market needs to be improved to be able to compete in the world market.

Planting material and processing equipment for freeze-drying, dehydrating, pickling and deep-freezing will have to be imported.

"The largest names in the business will soon be here, but we have to ensure that with them comes the technology and research and development input it takes to make Indian mushrooms global," says Mr C.K. Basu, an official in the food processing industries ministry.

ISRAEL HARD-SELLING 'FOOD FAIR WEEK'

In a bid to lure Indian corporates into setting up joint ventures with Israeli food-processing companies, the Embassy here is selling its 'food fair week' hard to those who are willing to listen.

The Counsellor for Economic Affairs, Embassy of Israel, Mr Samy S Ofri, told Financial Express that though the two nations shared certain similarities, there were complementaries that could be explored to boost trade activities.

The 'food week', it is learnt, will be a showcase of the latest products and technology in Israel, featuring most of the corporate majors, including Agrexco, Bio-Dar, China Delicatess, Gilboa Beit Hashita, Hod Lavan and Tivall.

Interestingly; the Embassy here has not yet communicated either with the Agriculture Ministry or with any of the Indian companies. Mr Ofri, in fact, seemed to be more keen on going through chambers of commerce who had hosted the Israeli agriculture minister and a trade team in December.

Mr. Ofri indicated that Israel is scouting for partners in food processing and is looking at India with great interest in order to access the burgeoning markets of South East Asia.

"We cannot penetrate these markets without India's help", MR Ofri said adding "and Indian can access the European as well as US markets through us."

The trust from the Israeli side would be two kinds of companies, those who want to diversify and those who want to spread wings into areas like canning of citrus and juices: "Till date, India has not really gone into these areas seriously", Mr Ofri explained.

Talking about multinationals, Mr Ofri said that Israeli companies were "not that big." So, no assembly-line products, no plum investments.

"What we can offer though", he added, "is good agri-teach, well developed R & D and great product innovations".

The "come hither" signals not withstanding, this could mean brisk business for those willing to invade the land of long life tomatoes, Galia melons and avocados.

HUMAN RESOURCE DEVELOPMENT FOR EMERGING FOOD INDUSTRIES - A SEMINAR

From 900-1800 hrs, on Saturday, 11.06.1994, at Taj Residency, Bangalore - 1.

The Indian food industry is poised for a tremendous growth as is witnessed by the setting up of manufacturing facilities by such multinationals as Cocacola, Pepsi, Kelloggs, Pizza Hut, Mc Donalds, Wimpy, B, Unilever, Heinz, Wrigleys, Mars M & M and others. Simultaneously, established Indian Food processors are also gearing up to acquire a greater market share for their products and preparing strategies to face competition from internationally established consumer food product brands.

The Centre for Processed Foods and the Association of Food Scientists and Technologists (I), Bangalore Chapter, have felt that it is an opportune time to conduct a seminar on Human Resource Development for Emerging Food Industries on Saturday 11th June 1994 in Bangalore. Eminent professional managers from the food processing and the food machinery - manufacturing industries have been invited to offer their long experience in dealing with the lack of availability, or unpreparedness, of industries in absorbing or adopting the newer emerging technologies that will aim at excellence in food product quality, service and delivery. This Seminar should be of great significance to both educational institution and food industries in developing a cadre of food scientists/technologists, engineers who will be able to meet the challenges of the future.

Registration fee is Rs. 100/- for members and Rs. 250/- for non-members.
For details contact: Dr. R. R. Mohite, Secretary AFST (I), Bangalore Chapter,
C/o ERG, 42/1, Palmgrove Road, Austin Town, Bangalore 560 047.
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COMPANY NEWS

LAKHANPAL FOODS

Gujarat Lakhanpal Foods Ltd., manufacurer of the well-known VAFA brand established since the last 23 years and well known in the processed fruits and vegetables market is undertaking major expansion plans.

The current expansion project, envisages an increased production capacity up 0,000TPA at its new factory constructed at Vadu village near Vadodara city.

The construction of the factory is complete. Orders for the plan and equipment have been appraised by SBI who have sanctionsed and disbursed a loan of Rs 85 lakh. A working capital of Rs. 210 lakh has been sanctioned.

As this is an existing project undergoing expansion, there is no gestation period.

The company manufactures a wide range of products like fruit pulp and juices, tomato products, jams, pickles, squashes and syrups canned and curried vegetables under the brand name 'VAFA'.

Currently the company exports 77.67 per cent of VAFA products to US, UK and Swizerland.

SHAW WALLACE

Shaw Wallace, the liquor giant of Calcutta, is going to form its beer division into a separate company with foreign equity participation, Mr. A. S. Malik, the Joint Managing Director of Shaw Wallace (SWC) said recently.

SWC had a major investment programme in the beer division, totalling to Rs 200 crore, in the coming three years. It would like some "long term relationship" with a foreign beer manufacturing company. Negotiations were in progress with four companies abroad.

But, some of these companies were not interested in equity participation but only in marketing arrangements for selling their beer brands in India.

Mr. Malik said that the investment amount would be split between expansion of the existing breweries of the company and setting up four new beer manufacturing units. The new breweries would be set up in Andhra Pradesh, Karnataka, in the eastern region and in the northern region. The Capacity of Skol Breweries would be doubled.

In fact, the announcements in quick succession of the formation of Global Gelatines as a separate company in the assisted sector with Punjab State Industrial Development Corporation and the plan to form the beer division into a separate company may really be parts of a restructuring plans for the SWC group as a whole. SWC would soon be a part of Jumbo India, which would be the holding company for all companies under the umbrella of Mr M.R.Chhabria, the Dubai-based non-Resident Indian.

Apart from the investment in breweries, SWC had plans to invest Rs 26 crore in the liquor division as well in the same period.

Two more distilleries were being planned, one in Karnataka and one in Uttar Pradesh.

VIKRAM DAIRY PRODUCTS

• Vikram Dairy Products is setting up mill processing plants at Ambergaon, Pune district, and at Taloja, Maharashtra at an estimated capital outlay of Rs. 4.80 crore. The company proposes to process homogenised milk, pasteurised milk and manufacture casein, dairy whitner and white butter.

The project is expected to go on stream by October 1994. To part finance the project, the company is going public with an equity issue of Rs 1.80 crore.

According to the project appraised by SICOM, the company is expected to record a net profit of 48.95 lakh on a sales of Rs 6.65 crores in the first year of its operation.

WEIKFIELD

Weikfield International Corporation has been awarded the prestigious "American International Quality Award 1994" for its range of desserts and processed food products - Custard powder, Jelly crystals, Caramel pudding mix "Cremelle" Corn flour etc. The award comes to them for fulfilling international standards in quality, customer satisfaction and human resource development.

About 1,800 samples of food products were considered for selection this year, of which only 27 per cent passed all quality standards. 30 per cent met some of the standards and 43 per cent failed all quality specifications. Weikfield's products were among the top scorers on all quality points.

The award was presented by Mr Mannan, Minister of Textiles, Government of Bangladesh, at a special function held at Dhaka, Bangladesh recently.

KISSAN / BBLIL

The decades-old Kissan products are being given a new look by Brooke Bond Lipton India Ltd (BBLIL), a subsidiary of the global food giant Unilever Plc.

While BBLIL is going to retain the Kissan brand name, a major restructuring is planned in the areas of manufacturing, technology, branding and marketing of Kissan products like jams, sauces, ketchups, and squashes. However, this is not likely to lead to an increase in the prices of Kissan Products, senior corporate sources said.

BBLIL acquired Kissan Foods Ltd. last year from Vijay Mallaya's UB group to make an entry into the meals components market in India. The move is, therefore directed towards bringing the quality of Kissan's operations to the level of BBLIL sources said.

According to the revamp plan, BBLIL is going to introduce Unilever's international manufacturing technology in Kissan units for making Kissan products, Moreover, the formulations of Kissan products have been changed. For instance, the new squashes are going to be more fruity in taste than the range last year, sources said.

The company has also made advance buy-back arrangements with farmers for vegetables such as tomatoes and red ripened chillies, and for fruits like mangoes, seedless lime and blue grapes.

The packaging of all these products is also being re-designed from the earlier staid look so that they look trendy and part of the same range , sources said.

BBLIL has also made a foray in the frozen vegetables market by launching the Birds Eye Green Valley range of fresh frozen vegetables in Delhi recently. The company is expected to invest over Rs 5 crore in the next few years to develop this range of products.

VENKY'S INDIA

Venky's India, of the Rs 250 crore Venkateshwar Hatcheries (VH) Group, a global player in the business of poultry breeding,

chicken processing and veterinary research, is planning to tie-up with the multinational fast-food giant, Kentucky Fried Chicken, for supply of processed chicken for Kentucky's Friend Chicken, for supply of processed chicken for Kentucky's proposed venture in India.

McDonald's arch rival Kentucky has already signed a MoU with Venky's for sourcing supply of processed chicken for their fast-food chain in India, which is to be operational shortly. McDonald's has also cleared Venky's to do business with Kentucky. To meet the additional demand and international quality standards, Venky's has already commissioned a new chicken processing plant near Delhi.

Venky's has also plans to tap the market in the North-Eastern states of India as there is a shortage of supply of processed chicken in the region. They also see it as a potential market . For this the company has recently submitted a proposal for a chicken processing project to the West Bengal Government.

Mr. A. Prasad, deputy general manager of Venky's in Calcutta said that the ideal location would be a district near Calcutta because this will solve the problem of inter-state transportation. The plant capacity would be a standard 10,000 birds per shift processing. Discussions are also on with a Singapore-based company, Sin Heng and Chang, for setting up a shrimp feed plant to be located on the Andhra coastline.

MICRO PLANTAE LTD

Phytotech Australia Pty Ltd. has appointed Bombay-based Micro Plantae Ltd. its exclusive licencee for the Indian subcontinent to grow and market the premium black "Marroo" seedless grapes.

The Marroo, believed to be the world's largest black table grape, was originally developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), part of Australia's department of agriculture. It is a cross between Carolina Blackrose and Ruby seedless.

Marroo, a big success in Australia, is now grown under licence agreements in Chile, Spain, South Africa and the United States. Attempts are under way to organise a common marketing alliance for all Marroo licencees, Mr Vineet Kumar, executive director of Micro Plantae, said. The marketing company will be jointly owned by all the licencees.

California's Marroo growers recently decided to adopt quality standards and apply gold and silver stickers on boxes to highlight the premium image.

The company, which has a tissue culture facility near Pune, proposes to set up a captive plantation of 100 to 150 acres for growing Marroo in India, Primarily for export. It will also be grown under contract cultivation on another 2000 acre. Micro Plantae will own the brand.

Plant protection rights, which GATT enjoins India to enact, will help the company limit the growing area, as in other countries where Marroo is grown, Mr. Kumar said Marroo's US licencee has decided to restrict cultivation to 5000 acres in California.

Chile exports most of its output to North America, and South African production goes to Europe where Micro Plantae, too, plans to enter. Australia and the US grow largely for their local markets.

Marroo's advantages include above-average output per acre, resistance to downy mildew, a widely prevalent vine infection, and minimal consumption of giberallic acid, a growth promoter used by all growers.

The Marroo (from the Australian aborgine word for black) also tastes "different", commanding a premium in the American market.

The Marroo is expected to fetch a premium in the Indian market where local black varieties command a price of around Rs. 60 a kg. Recent research in Israel has pointed to the therapeutic properties to black grapes against several diseases, including cancer.

In the developed world, supply has not been able to catch up with the demand for black table grapes because of a shortage of black seedless varieties. Black grapes constitute only around 15 per cent of the table grape market. The US has some 30,000 acres under Flames, an old but established variety of black grapes.

ROADMASTER FOODS

Roadmaster Foods Ltd, engaged in milk processing, has planned to set up a project for processing 4.5 lakh litres of milk for manufacturing sophisticated value added products like skimmed milk powder (4000 tpa), whole milk powder (2200 tpa), dairy whitner (4000 tpa), butter (1900 tpa), ghee (3600 tpa) and I lakh litres of liquid milk in pouches per day.

The cost of the project as appraised by ICICI is estimated at Rs. 16.04 core which is proposed to be financed mainly by equity issue to the public of 25.95 lakh shares of Rs. 10 each at a premium of Rs. 10 per share aggregating Rs. 5.19 crore. The balance is proposed to be met through 3.30 lakh equity shares on similar terms which are reserved for ICICI and SCICI, rupee term loans of 5.50 crore, rights isse of equity shares at a premium of Rs. 6 per share to the existing shareholders aggregating Rs 3.46 crore.

The present installed capacity of the company is 3 lakh litres per day. For the year 1992-93, the company earned a net profit of Rs. 79 lakh on a total income of Rs. 32.66 crore giving an EPS of Rs. 3.64. For the same period, the net assets value of the company stood at Rs. 22.60.

CONCERT SPICES

Concert Spices and Exports Ltd. has now entered overseas markets mainly in the Gulf region, UK, Japan, etc. with a range of food items under the brand name "Magic Mix". The company has also developed ready-to-cook range of curries for chicken, fish, meat and vegetables which enable instant cooking avoiding all hassles and messy operations connected with preparing an Indian curry.

The board of directors of the company consists of Mr. Paul Pothen (Chairman). Mr. Mathew Anthraper (Managing Director), Mr. P. Seetharaman (Executive Director), Mr. A.S. Narayana-Moorthy, Dr. Besant C. Raja, Mr. Sunder Iyer and Mr. Varkey Jacob.

Promoters, directors, relatives and friends hold 40 per cent shares and public holds 60 per cent. The company manufactures complete range of spices, oil and oleoresins which are used as food ingredients by food packaging industry in all developed countries. The company has done substantial work in promoting sales of its products to a large number of overseas customers. The company has already started executing export orders for various items.

The company has recently concluded an agreement with a leading Japanese company for contract manufacturing and packaging of various consumer products mainly food seasonings to be done at the company's plant on behalf of the Japanese company. This is a very significant breakthrough as Concert spices will get access to the Japanese and South Asian markets.

The company is also planning to set up flavour house in India on a joint venture basis with an overseas partner from Europe for which negotiations are in progress. The company was aiming to achieve a quantum jump in its production and sales during the current year.

NDDB

The National Dairy Development Board (NDDB) is planning to enter the ice cream market. Production of ice cream is at present reserved for the small scale sector. However, large units are allowed to pack and market under their own brand names.

Thus, the major players in the Rs 280 - crore Indian ice cream market have to source their product from SSI units.

The NDDB chairman, Dr. V. Kurien has already requested the government to allow the co-operative and public sector dairies to diversify into ice cream manufacturing along with the SSI entrepreneurs. However, he is not in favour of the government allowing entry of medium, large and multinational companies into this sector.

According to the NDDB's plans, the ice cream will be manufactured by public sector dairies and corporative sector plants and marketed by the NDDB.

The move is mainly aimed at boosting the lagging bottom lines of several cooperative and public sector dairies, which are at present only distributing liquid milk much to the detriment of their profitability.

While NDDB is confident that its entry is not likely to to harm the interests of SSI units since it is going to target a difference class of consumers, the company is ready to give the big ice cream retailers a run for their money with low pricing.

One way the NDDB plans to lower prices is by cutting down marketing costs. "Some of the major ice cream retailers in India are lifting ice cream by air from one place to another, resulting in heavy transport costs and consequent high prices of ice cream to the consumers," the spokesman said. " The co-operative sector will prevent such misuse of national resources," he added.

NDDB already enjoys a high brand loyalty for its Amul and Dhara product lines. It is now confident that the USP of its ice creams too would be the use of fresh milk and milk product, unlike other companies who use preserved milk products

Moreover, better hygiene standards will be maintained because of the better/trained manpower and modern infrastructure available with cooperative institutions, the spokesman pointed out.

Ruling out possibility of setting up a marketing network of ice creams made by SSI units, the spokesman said any attempt to sell ice cream made by a number of SSI units of varying quality and questionable purity would lead to failure and be a serious risk to public health.

MILK SPECIALITIES

Milk Specialities, which is setting up manufacturing facilities for the processing of three lakh litres of milk per day for the manufacture of milk and milk products, has already reached its first year's entire production even before starting commercial production, according to Mr. Jagjit Singh, Managing Director. Explaining this at a press conference in Bombay, Mr. Singh said that the company has secured a firm order from Kays Trading Company, Dubai for export of 3,000 tonnes of skimmed powder, 1,000 tonnes of whole milk powder and 1,500 tonnes of pure ghee for 1994-95 which will cover entire one years production of these products. The company is expected to start commercial production next month.

The Rs. 14.65 crore project is fast coming up at Patiala district, Punjab. The district is amongst the richest milk producing pockets in the country. The project is in the joint sector along with Punjab State Industrial Development Corporation.

The Company proposes to market packed liquid milk in the first phase in Chandigarh, Mohali and Panchkula and will be producing 25,000 LPD and 30,000 during its first two operational years.

As per the Industrial Financial Corporation of India (IFCI), the company expects to achieve sales of Rs 36.63 crore, Rs 43.45 crore and Rs 51.28 crore respectively in the first, second and third year of operations at 50 per cent, 60 per cent and 70 per cent capacity utilisation. It hopes to earn a net profit of Rs 28.95 lakh, Rs 114.19 lakh during these years.

KEVENTER AGRO

Keventer Agro has recently signed a memorandum of understanding with the multi-billion dollar US company Dole Foods Co. and has floated a new company called Keventer Agro Dole Ltd. The Company is a joint venture with both the parties deciding to share the initial paid-up capital equally.

According to the directors of the company, the manufacturing base will be set up at Keventer's existing food products base at Barasat, West Bengal. The venture will initially take off with fruit concentrates being the main area of operation but will eventually diversify into Dole's other fruit items that has made the company so well known worldwide.

The deal was signed last month when one of the senior directors of Dole, Mr Paul Cuyegkeng was in India. The initial paid-up capital of the project has been pegged at $1 million (Rs 3.5 crore approximately).

The venture will for the time being be a 100 per cent export oriented unit with operations to begin around November-December, 1994. "We hope to enter the domestic market two years later," said Mr. M. K. Jalan, a senior director of Keventer Agro.

In order to facilitate the business in India, the company is also buying a big piece of land near Purulia (West Bengal), in order to set up a horticultural centre. The centre will grow a

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few variety of fruit with the technology coming from Dole's headquarters in the US.

Dole Fruits, with an estimated profit of more than $200 million worldwide on a turnover of around $3.7 billion, is known for its booming real estate and food businesses.

HERMAN MILKFOODS

Chandigarh-based Herman Milkfoods Ltd. (HML) a joint venture co-promoted by the Punjab State Industrial Development Corporation Ltd. (PSIDC), is entering the capital market with a public issue of 41.7 lakhs equity shares of Rs. 10 each to part finance the cost of a project to be set up in Patiala district for the manufacture of milk powder, butter, ghee and packed liquid milk.

HML has tied up with Virosh Trading Co. Ltd. of Mauritius for marketing milk powder in Mauritius, South Africa and other PTA countries.

IFCI has appraised the cost of the project at 14.82 crores and had provided a term loan of Rs 4.7 crores while Punjab National Bank has provided a term loan of Rs 1.2 crores.

TRI-STAR SOYA

Tri-Star Soya Products Ltd., one of the largest soyabeen processors, has undertaken 'forward integration programes' besides expansion of its existing processing capacity further from 2.25 lakh TPA to three lakh TPA. The company has recently completed the expansion if its soya capacity from 1.50 lakh TPA to 2.25 lakh TPA. Further expansion of the company's soya capacity is expected to be completed by October 1994.

NUTRINE CONFECTIONERY

Reddys of the closely-held toffee market leader, Nutrine Confectionery Company Ltd., are looking for "strategic alliance" with giants in the field to get the latest technology and expand the market share. They are interested in forging a technology tie-up in the light of opening up of the economy with an accent on globalisation.

They said the company is attracting offers directly and through agents for such an alliance and equity participation.

In the last couple of months, market has been talking of takeover attempts on Nutrine.

The suitors list include the multinationals Nestle, Cadbury and Pepsi and Parry Confectionery Ltd. of the Murugappa group.

Although sources in Parry's denied having shown interest, informed sources said the Reddys did not find the offer attractive.

Nestle, with stroing interest in coffee, came closer to clinch the deal, but had fallen through for undisclosed reasons.

Softdrink maker Pepsi is said to be very much in the race and has not given up hopes.

Industry sources say Nutrine's stronghold is its "distribution muscle" with 38 warehouses all over the country, 2,500 distribution outlets and 3.5 lakh retail points. The company with its factory at Chittoor in Andhra Pradesh, has launched 76 varieties of chocolate and poised to lift the turnover to Rs. 125 crore this year from Rs. 110 crore last year. It is also planning a new unit at Tirupathi.

In terms of volume, Nutrine is an undisputed market leader claiming over 34 per cent share. In premium brands it trails companies like Parry's, Parle and Ravalgaon.

Industry sources are sceptical about the company forging any strategic alliance with multinationals which in their viewe will not settle for nothing less than a total control.

SMITHKLINE BEECHAM

The century old milkfood drink, Horlicks, has been re-launched as New Horlicks by Smithkline Beecham Consumer Healthcare India, part of Smithkline Beecham Plc, London.

Besides the efforts of the Indian and International R and D teams of Smithkline Beecham over the last three years, extensive market survey and research played a key role in the developmentof the new brand.

It is launched in an attractive new jar and the label design is in line with what is marketed world wide. In addition to quality protein and extra calcium, New Horlicks is claimed to contain eight essential vitamins and iron nutrients. The price is about eight per cent more thatn the previous brand.

According to the company, Horlicks enjoys a whopping 46 per cent share of the 45,000 tonne Indian milkfood drinks market. The relaunch is intended to reinforce its positioning and make it one of world's leading science based healthcare companies.

Smithkline, which posted a turnover of Rs. 236 crores in 1993, recently changed its name and is focusing on products like Chocolate Horlicks, Junior Horlicks, Boost and Eno.

VGP AQUA FARM

VGP Aqua Farm Limited, a company promoted by the VGP Group has launched a new scheme of owning an aqua farm with an investment of Rs. 29,000,per unit. According to the scheme, a total of 1,000 acres of farm lands located at the coastal belt of Andhra Pradesh and Tamil Nadu, will be developed for shrimp farming. Each acre of land will be divided into 20 units of five cents each with undivided share of land. An investor in this scheme will have an option to purchase one or more of these units of five cents at Rs. 29,000 per unit.

The company claimed it will develop the cluster of units by applying efficient scientific and professional shrimp culture practices. The project will be fully insured at every stage against all possible natural calamities and all the financial risks will be covered by insurance, as per the shrimp culture and export insurance policy. The estimated return to the investor, after a gestation period 30 months from the receipt of final payment for the units, will be 25% more everu year for a period of 30 years.

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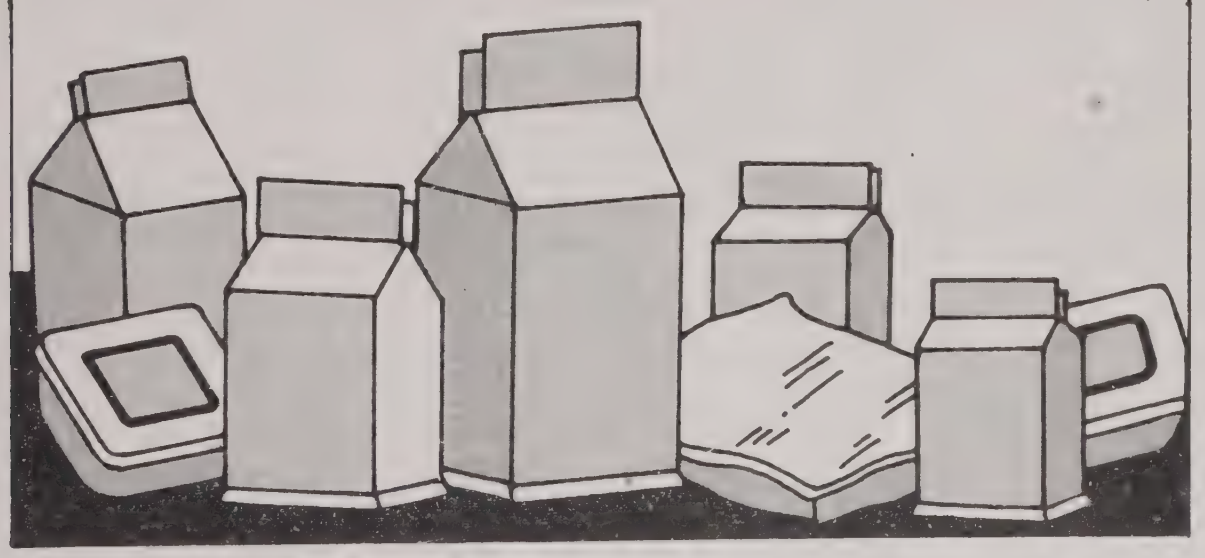

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INDIAN EXPORT HIGHLIGHTS

SPICES

India's spices export has recorded a growth of 36% in quantity and 35% in value during the current financial year upto February 1994 compared to the corresponding 11 months of last year.

The total export during April-February 1993-94 was 1.48 lakh tonnes valued at Rs.471.60 crores as against 1.09 lakh tonnes valued at Rs.349.49 crores during the corresponding period of last year, according to the Spices Board.

Pepper exported during the period under review had shown a substantial increase of 129 per cent in quantity and 163 per cent in value. Decline in production in major producing countries like Indonesia, Brazil and Malaysia had resulted in a short supply in the world market enabling India to export more.

LITCHI

The Centre has prepared an ambitious programme to export 500 tonnes of 'litchi' during the current season (1994-95) to earn Rs.500 crore worth foreign exchange,

The general manager of the Agricultural and Processed Food Products Export Development Authority (APEDA), Mr. S. Kankan, also told newsmen that during 1993-94 only 40 tonnes of the fruit were exported.

The target for 1995-96 had been fixed at 1000 tonnes when the foreign exchange earning was projected at Rs. 1000 crore, he added.

Mr. Kankan was at Patna as a member of the high-level team from various central government departments to survey the prospects of export of 'litchi' from Bihar. Other members of the team were the executive director of the national horticultural board, Dr. D.K.Uppal, and executive director of Nafed, Mr. S. C. Singhal.

AGRO PRODUCTS

Agro exports during 1993-94 are likely to exceed the target of $2.25 billion and bring in as much as $2.5 billion.

According to the latest figures, exports of agriculture and allied commodities (excluding raw cotton, plantation and castor oil during April-January 1993-94 have already touched $2,399.96 million (Rs.7.527.15 crore), an 18,87 per cent increase over the corresponding period of the previous year. Of this, marine products have performed well, recording $594.98 million, a 25.5% increase over the same period in 1992-93.

The break-up of the various segments shows that bulk items continue to do well. Moreover, spices have recovered from its poor performance in the previous year to record export figures of $135.89 million (Rs.426.19 crore), a 26 per cent increase. The quantity exported was 1.33 lakh tonnes. Cashew has also firmed up, with $288.63 million (Rs. 905.26 per cent increase.

The largest single chunk was in oilcakes/extractions, with $448.5 million (Rs.1,406 79 crore) worth of exports,, a 20.20 per cent increase. Overall, HPS groundnut saw the single biggest increase, with Rs. 103.49 crore worth being exported against Rs. 1.4 crore in the same period the year before.

The export of fresh fruits and vegetables - being seen as the great new frontier - has risen from Rs. 269.11 crore in April-January 1992, to Rs.340 crore in the corresponding period of the current year.

The country also exported 3.28 lakh tonnes of basmati rice - the exports of which the agriculture ministry is aiming to increase in a big way - valued at Rs. 713.03 crore, as against 2.15 lakh tonnes valued at Rs. 545.76 crore, the year before. It also managed 500 tonnes of wheat, worth Rs.0.13 crore. The overall cereals basket showed an increase - Rs.882.21 crore over Rs.725 crore in April-January 1992-93.

Sugar and molasses, however, decreased from Rs.268.17 crore to Rs. 267.64 crore in this period, while tobacco showed only a marginal increase of Rs. 14 crore over the Rs. 414 crore recorded the year before.

SOYMEAL

India's soymeal exports are expected to rise 30 per cent in the 1993-94 fiscal year, ending in October.

Exports in the current season could reach 2.6 million tonnes, up from two million the previous year.

Exporters said up to 1.6 million tonnes had already been sold abroad and another one million was expected to be shipped by October. They said soymeal prices had stabilised at $206/210 per tonne after dropping to $180/185 at the start of the season in November, when the 1993-94 crop was estimated at a bumper 4.6 million tonnes.

The crop numbers have since been revised downwards to 4.1 million tonnes, up from 3.1 million in 1992/93.

MARINE PRODUCTS

Exports of Indian marine products have grown steadily over the years. In 1992-93, these exports earned foreign exchange valued Rs. 17,676.3 million.

India exported marine products worth Rs. 22.95 million to Germany in 1992. The scope for increasing these imports to Germany can be seen from the fact that the total imports of marine products by Germany in 1992 were valued at Rs. 57,600 million.

German consumption of fish in 1992 was 1.2 million tonnes, which means about 15 Kgs. per head. Most favoured are the herring and sea salmon. As exotic marine products from remote corners of the world are reaching German menus, fresh fish is rarely seen on their tables. Canned products or deep frozen products are more popular. During 1992, 80% of fish products were imported. Main suppliers of fish to the German market are Denmark followed by Norway and Netherlands.

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For details, write to : **Expoconsult Pte. Ltd., 100 Beach Road, # 27-08 Shaw Towers, Singapore - 0718, Tel: ++65 29 99273, Fax: 65 29 99782.**

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Venue : Paris, France
Date : 23-27 October 1994

The International Food products exhibition, (SIAL), held in Paris every second year, brings together representatives of the food industry from over 140 countries exhibiting in an exhibition area of 1,64,000 m2.

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For further details, contact: **SIAL 39, Rue De La Bienfaisance 75008 Paris-France Tel: (33) 1 42 89 46 87 Telex: 650614 Fax: (33) 1 42 56 72 33, (33) 1 42 89 46 94.**

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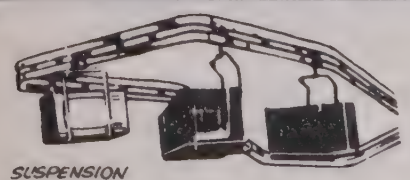
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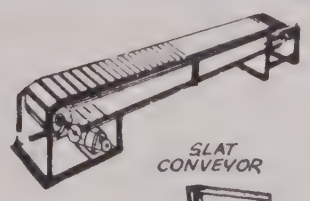
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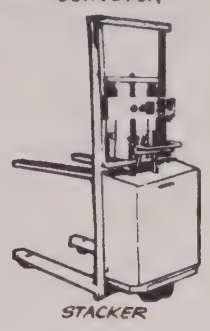
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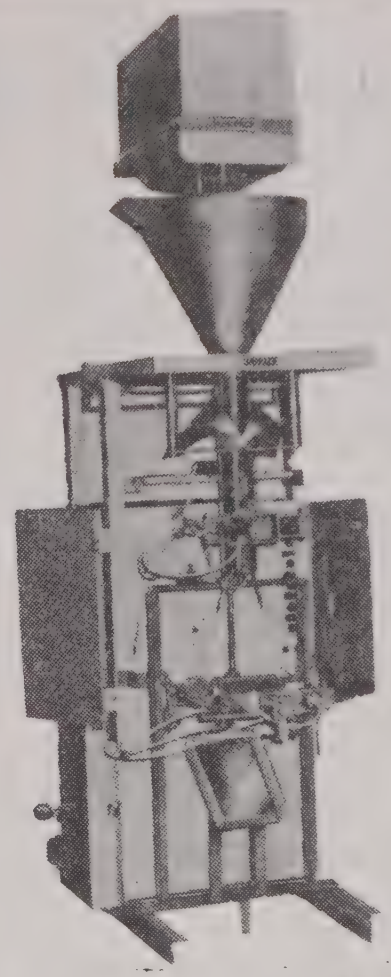

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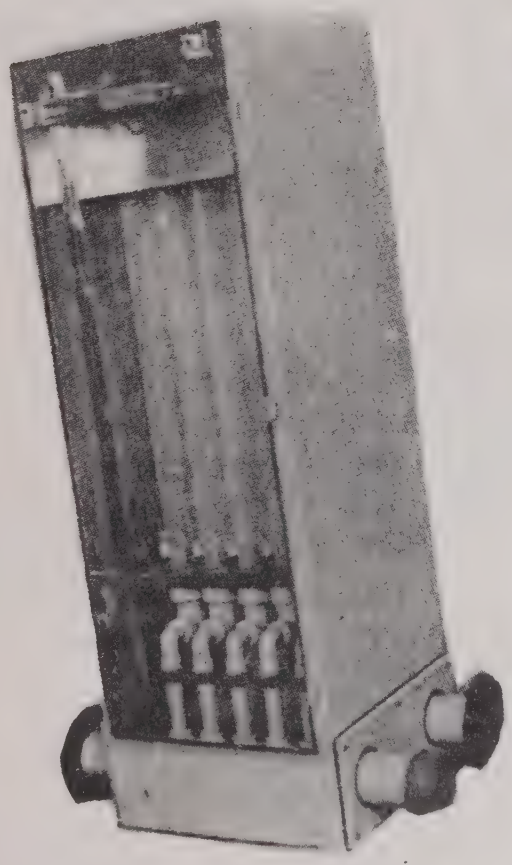

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BOOK REVIEWS

Mycotoxins in Grain : Compounds other than Aflatoxin. Edited by J. David Miller and Locksley Trenholm. Order from : Eagan Press, 3340 Pilot Knot Road, St. Paul, MN. 55121-2097 USA.

This may be the first book on mycotoxins not dealing with the most notorious of mycotoxins, aflatoxin. Though continued economic importance and health significance of aflatoxins is recognized, after four decades of extensive research, our knowledge of aflatoxin has become so immense that many good treatments on various aspects of aflatoxins are already available.

At the eighth International Union of Pure and Applied Chemistry (IUPAC) Symposium on Mycotoxins and Phycotoxins in Mexico, November 1992, Pieter Stein, President of the Applied Chemistry Division of IUPAC used the term "fumonisin generation" of mycotoxin researchers. His statement reflects the substantial shift of research effort from aflatoxins to other agriculturally important mycotoxins produced by several genera of fungi. These toxic metabolites include the trichothecenes deoxynivalenol and nivalenol, zearalenone, and fumonisins from various *Fusarium* species that occur worldwide. *Ochratoxin* from *Aspergillus ochroceus* and *Penicillium verrucosum* is a problem in western Europe, but it can occur elsewhere including North America. Several toxins from Alternaria species appear to be important in certain geographical areas.

This is a reference text on the chemistry and biology of mycotoxins other than aflatoxin, with emphasis on those that affect food safety and animal health and productivity. The chapter on the chemistry of mycotoxins outlines the molecular structures and spectroscopic data where appropriate. Mass spectroscopy and nuclear magnetic resonance spectroscopy data acquired on modern instruments are included for those *Fusarium* metabolites discovered during the past decade. Since *Fusarium* species are primarily plant pathogens, the text highlights plant pathology and plant breeding for fungal resistance in affected crops. The species of *Aspergillus* (other than *A. flavus or A. parasiticus*) and *Penicillium* that produce important storage mycotoxins are discussed in terms of their ecology and physiology. In contrast, toxigenic *Alternaria* species are largely saprophytic on senescent cereal tissue.

Mycotoxin-contaminated grain is associated with food safety issues and the health and productivity of farm animals. In this book, several perspectives are included: overall toxicology; immunotoxicology; and the important new area of study, the interactive effects of mixtures of mycotoxins. An appraisal of decontamination technology is also provided.

Finally, the consequences of mycotox in contaminated grain for humans are considered: strategies used in risk assessments for mycotoxins in food. mycotoxin residues in animal products used for human food, and the economic impact of mycotoxins on agriculture and food production. After almost 30 years, the human carcinogenicity of aflatoxin has been established (International Agency for Research on Cancer Monographs on the Evaluation of Carcinogenic risk of Chemicals to Humans no. 56. 1993. IARC, Geneva). The role of the other mycotoxins in human disease has not been firmly elucidated. A surprising number of human diseases have been blamed on mycotoxins in food. These are reviewed. As was the case for aflatoxin, the importance of fungal metabolites, such as fumonisin, deoxynivalenol and/or nivalenol, and ochratoxin will require much more study before their impact on human health is fully known.

Current Good Manufacturing Practices/ Food Plant Sanitation, 2nd Ed, Published by CTI Publications, Inc; 2619 Maryland Avenue, Baltimore, MD 21218-4576 USA Price US $87 (airmail included)

CTI Publications announces the release of the Second Edition of Current Good Manufacturing Practices/Food Plant Sanitation, (January, 1994), authored by Wilbur A. Gould, Ph. D, and published/copywritten by CTI Publications, Inc., Baltimore, Maryland.

This new work covers all Current Good Manufacturing Practices as prescribed by the United States Department of Agriculture, Food and Drug Administration, as it applies to food processing and manufacturing. The book starts by reviewing the need and background of Good Manufacturing Practices and Sanitation. The reader is guided through the CGMP's and provided with various plans and sanitation controls for a modern plant.

A total of 23 Chapters, covering all phases of sanitation, including: Type of Inspection: Planning a Plant Sanitation program; Equipment Design for Sanitation; Warehousing; Storage, Shipping and Receiving; Food Containers and Packaging Materials; Control of Rodents; Control of Insects; Food Plant Microorganisms; Fundamentals of Chemistry and Cleaning Food Safety and Hazard Analysis; Making Food Plant Inspections; Recalls, etc.

The book is well illustrated and has practical charts and tables.

Dr. Wilbur Gould is Professor Emeritus of Food Processing and Technology, Department of Horticulture, and former Director of the Food Industries Center at Ohio State University, as well as Executive Director of the Mid-America Food Processors Association. Dr. Gould has authored six books and has written hundreds of technical papers and articles for trade journals.

Guide To Food Transport Fruit And Vegetables. Published by CTI Publications Inc., 2619 Mary land Avenue, Baltimore, Maryland 21218-4547, USA. 260 Pages, 1989, hardbound. Price $98.00 outside USA - Shipped Via Airmail.

The full colored book describes 100 of the most important products in the fruit and vegetable category. It gives advice and information regarding: standards and regulations for transportation, minimum requirements for storage, storage life, perishability, treatment, ideal and recommended temperature conditions, sensitivity to storage temperature, humidity and ethylene, heat production, specific heat, and specific weight. In addition, the book discusses important subjects such as refrigeration, packing and stuffing, atmosphere control, chilling injuries, mixed loads, ventilation and code of good transporting practice. The Guide to Food Transport is intended to help by providing guidelines to follow so that costly food cargoes reach their intended destinations in the best shape possible.

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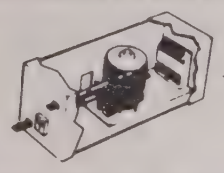

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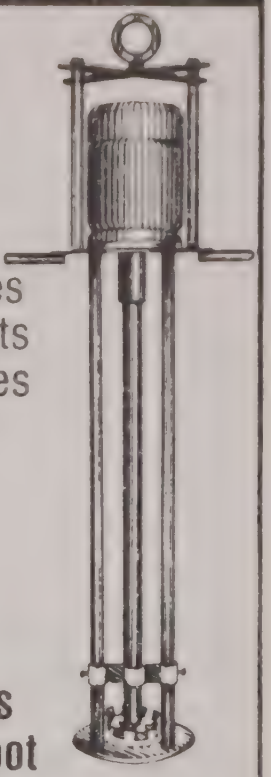

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Publisher

25th May, 1994

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For BOLDFACE LISTING (Without Ad release) cost of above details is Rs. 250/- by Bank Draft only.

PRODUCT REVIEWS

ESSENTIAL OILS

L. B. Aromas & Chemicals are engaged in manufacture of all kinds of Natural Essential Oils and Herbal extracts. Oils such as sandalwood oil, palmarosa oil, lemongrass oil, gingergrass oil, peppermint oil are just a few from the wide range produced by them. They also manufacture Spices and Oleoresins from thyme, celery seed, ginger, curryleaf, capsicum, etc.

Among their herbal oils are Calamus Root oil, Jatamansi Oil, Juniper Berry oil, etc.

These quality products are used in Pharmaceutical, ayurvedic, confectionery, food and flavour industries. The company supplies to all major well known companies in India.

For further details, write to :

L. B. Aroma & Chemicals,
4-Omex Chamber, gr.fl.,
Rajshri Shahu Marg (Teli Gali Rd.)
Andheri (E)
Bombay 400069
Tel : 6121258/6133066
Fax : 6111646 Tlx : 78159 FCS IN
Grams : OIL TRADES, Bombay 57

FOOD COLOURS

For ISI mark VINOL basic food colours, and SUNNY blended food colours contact manufacturers Vino Synth Chem Pvt.Ltd. Colours such as tartrazine, sunset, yellow, Carmoisine, Ponceau 4R, Lemon Yellow, orange, orange red, kesar green, raspberry red, chocolate and many more are available for local consumption, as well as for export.

Write to :

Vino Synth Chem Pvt. Ltd.,
404 Bezzola Commercial Centre,
Sion Trombay Road,
Chembur,
Bombay 400071
Tel : 5522539/5528958
Cable : VINOBIN Fax : 5522539

FOOD GRADE CHEMICALS

Olin Chemicals are dealers and suppliers of a wide range of Antioxidants, enzymes, essential oils and food grade chemicals such as Sorbic Acid, Citric Acid, Sodium Citrate, Pectin, Vanillin, Fumaric Acid, Lemon oil, Lime oil, Lecithin, Liquid Glucose, Rennet, Wax etc.

Their products are supplied to cheese manufacturers who use their rennet, sorbic acid, sodium citrate, wax; to ice cream and soft drink manufacturers, to beer and wine industries, pharmaceuticals, and other processed food manufacturers.

Their sister concern, Goodrich Flavours & Fragrances, deal in, Flavours, Essences, Emulsions, Food Colours and Fragrances.

For your requirements, contact :

Olin Chemicals,
A - 303 Padmavati Nagar,
Gen. Arunkumar Vaidya Marg,
Goregaon (E),
Bombay 400063
Tel : 8406988/8413111 Fax : 8734332

BISCUIT/BREAD BAKING OVENS

Admir Engineers manufacture all types and any size of gas and oil fired biscuit and bread baking travelling Ovens which are designed to run on direct and indirect fired for biscuit and bread baking plant, barrel drying, tin, printing, etc.

The Indirect Oil Fired Ovens are specially suited for all varieties of quality biscuits.

The ovens are more efficient in terms of baking performance and fuel consumption. The temperature profile for each variety of biscuit is automatically maintained as per the requirement.

For further details, please contact:

Admir Engineers,
Plot No. 1/E-4 Shivaji Nagar,
Govandi, Bombay 400043
Tel : Office - cum Res : 5560446/5511718/5518182

FOOD PROCESSING MACHINES

From K. X. Benedict of Cochin come indigenous machines with operation production knowhow for production of steam-cooked, partial vacuum dried tapioca, packed in polythene bags as ready to eat routine food item; Meat and Vegetable cutlet making plants machine for production of fine husked and crumbled wheat and knowhow for mobile Fashion Food Restaurant. K. X. Benedict will supply a feasibility report of each project including technical, financial, market and all other relevant details, if you send a remittance of just Rs. 850/- per project to them.

The Report is useful for engineers, enterpreneurs and industrial managers, and contains information such as details of Indian and foreign demands for various products and services, methods of preparing highly effective and low cost advertisements etc.

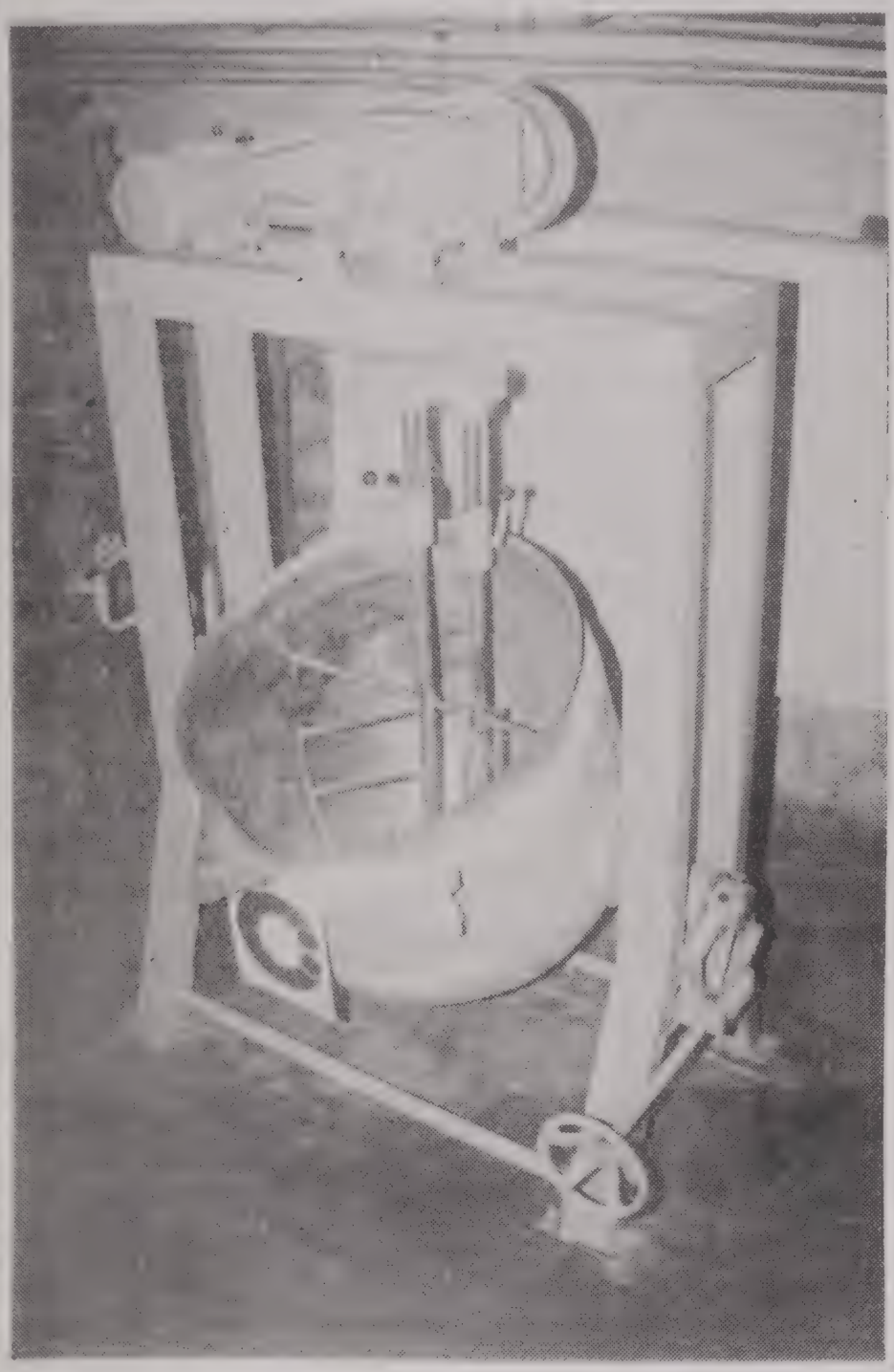
Write to :

K. X. Benedict
Technical Consultant (R&D)
Kurupacherry House, Ochanthuruth,
Cochin 682 508.
Tel. : (04852) 2407 Fax : (0484) 370378
Tlx : (0885) 6304 CCCC IN

GUM BOILING PANS

Stainless Steel Gum Boiling Pans manufactured by Cosywo Engineering Company are supplied in 100,200 and 400 kgs capacity either in single, double or triple configurations having spherical bottom and a jacket from thick M. S. Plate.

Slow speed S. S. Stirer arrangement is supplied with cantilever arrangement or with removable stirrer arrangement. These are useful for cooking printing gums, size etc.



For more details, write to :

Cosywo Engineering Company
15, Laxmi Co-op Industrial Estate Ltd.,
Near Nagarvel Hanuman Mandir,
Amraiwadi Road,
Ahmedabad 380 026
Tel. : 368168 Gram : COSYWO

FLAVOURS & FRAGRANCES

Sonarome Chemicals Pvt. Ltd. are one of the leading manufacturers of high quality flavours and fragrances. The company based in Bangalore manufactures a wide range of flavours for use in biscuits and bakery products, fruit products, confectionery, aerated and distilled beverages, snack food etc., all their products to big and small customers all over India and also export. The company has good expansion plans and plans to set up a modern research centre besides diversifyinng in related fields.

Sonarome are looking for suitable tie up with a multi-national to get expansion in the international markets.

Sonarome Chemicals Pvt. Ltd.
C-136, Peenya Ind. Area,
Peenya IInd stage, Bangalore-560 058.
Tel. : 839 48 04 / 839 55 95
Tlx : 845 88 48 Fax : 333 48 02

GUM ALGEL

From Alok Chem Corporation now comes GUM ALGEL which is a stabiliser/thickener/binder used for production of various food products such as icecreams, dairy and non-dairy products, sauces, soups and canned convenience foods, bakery products, cheese products, and also have various other food applications.

Alok Chem manufacture all types of Gum, e.g. Gum Arabic, Gum Acacia, Gum Guar, Gum Tragacanth, Gum Ghatti, etc.

For youe requirements, write to :

Alok Chem Corporation
406 Goradia House,
100/104, Kazi Sayed St.,
Bombay-400 003.
Tel. : 342 63 90 / 5356 Fax : 91-22-342 63 90

PECTIN/LIME OIL

Southern Citrus Products of Gudur in Nellore District are well-known manufacturers and suppliers of Pectin in 150 grade, Pectin I. P., and Lime Oil (Distilled).

For your requirements, contact :

Southern Citrus Products (P) Ltd.
Gudur 524 101.
Nellore District, A.P.
Tel. : 21328 / 21528

SAGO STARCH

Sagoserve, an industrial Coop Society deals in Tapioça finished products, and is one of the largest in Asia. Starch finds application in food, non-food items, and as raw material for various industrial products.

Sagoserve has introduced a novel scheme of Daily Tender System by which sago and starch manufactured from tapioca roots is marketed. Sagoserve has an annual sales turnover of Rs. 107 crore selling 1.5 lakh tonnes of starch and sago.

For details, write to :

Mr. Vishwanath Shegaonkar, IAS
Chairman & Managing Director
SAGOSERVE,
Salem (T. N.)
Tel. : 448046 / 448465 / 447673
Tlx. : 450-272 SAGO IN Grams : SAGOSERVE

AIR CURTAIN

The equipment is highly effective in creating invisible air barrier between inside and outside atmosphere thereby preventing the entry of outside hot air, dust, humidity etc. in the event of door being left open. The requirement of closed door entry is nulified once our CECON AIR CURTAIN is installed and you can maintain free movement of men and material. CECON AIR CURTAIN also conserves energy as loss of air-conditioning is restricted due to air-lockade created by vertical air flow. Easy to instal with low power consumption as well as noise level, CECON AIR CURTAIN is very useful for Industries, Hospitals, Research Laboratories, Computer rooms, Telephone Exchanges etc.

For furhter details write to :

Cecon Instrument Inc.
298/207/2, 1st Floor,
Laxmi Bhawan (Near Indira Bridge),
Nishatganj, Lucknow-226 006.
Tel. : 386331, 386228 Cable : CECON,
Telex : 435-436 FASTIN
Fax : 0522-242061 CECON

WATER PURIFIERS

Alfa Water Purifiers & Appliances are now known as ACE Water Purifiers Pvt. Ltd. but their product remains the same: 100% safe water through their various models made as per W. H. O. specifications, using international time tested Quartz Glass technology, using heavy duty American Slimline UV lamps with a unique wiper assembly for self cleaning.

Ace Water Purifiers manufacture a complete range of Water Purification systems. The company has various models which range from 100 lts/hr. to 1,00,000 lts/hr. output capacity. Alfa Water Purifiers are made from 30.4 Grade stainless steel for long life and durability.

All systems are backed by a one year warranty. Reputed Customers include the Taj Group, Oberoi, Ramada, Leela, Windsor Manor, besides thousands of smaller hotels, restaurants, canteens etc.

For more details, write to:

Ace Water Purifiers Pvt. Ltd.,
222 Shah & Nahar A-2
Lower Parel,
Bombay 400 013
Tel: 4945957 / 4944942 Fax : 22-4954250

POTATO STARCH

Potato Starch is very useful in food industry. Some of the uses are:

i. In the manufacture of extruded confectionery products. Thin boiling modified potato starch is used for making wine gums, liquorice lozenges.

ii. Light and airy texture is obtained in layer cakes and sponge cakes with potato starch. Waffle baking uses potato starch to obtain the correct crispness and a smooth distinct pattern. The smooth running properties of potato starch are used as a release agent for cake and bread tins. 2% potato starch in icing sugar will act as an anticaking agent.

iii. Meat industry uses potato starch for its very high water holding capacity and low gelatinisation temperature. Canned meat, canned soup etc. find potato starch useful. Potato starch is used in the production of fish balls and cod roe.

Samples can be had from:

Narayan & Co.,
1, Manglam Building,
Kankuwadi, P. M. Road,
Vile Parle (East)
Bombay - 400 057.
Tel: 614 5952 / 614 8226
Fax: 610 1243

LUG CAP SEALING MACHINES.

Introducing for first time, Twist-off Lug cap sealing machine to give 100% leak proof air tight seal for 53mm & 63mm Lug Caps. Thorough R & D has evolved innovative machines which are successfully packing over one million bottles without maintenance.

Semi Automatic and Automatic machines have capacity of 1200 & 2200 bottles / hr respectively. Innovative design ensures smooth working and eliminate holding of glass bottles while capping operation. Only effortless manual bottles movement is required which eliminates need of skilled worker. Standard machines are designed to work for any bottle height from 9 cm to 15 cm.

For more details, write to:

Raj Products & Equipments.
P. O. Box - 8075,
Bombay - 400 056.
Tel: 819 2250 / 819 2750
Fax: 91-22-8192750 / 8375628.

DIGITAL THERMOMETERS

Energy saving is perhaps the leading use of IT-101 and C-1600 Non-Contact digital Infrared Thermometers manufactured by Material Control, Inc. USA which are radiometric instruments designed to accurately measure surface temperature without contact. These thermometers drastically reduces the man-power required to check the steam-traps and clogged steam lines to heaters. One can detect damaged insulation and find hot spots on the sides of furnaces and heated tanks. Spotting excessive friction in machinery and mechanical systems. The instruments are equally useful in pin-pointing trouble from a power panel, electrical equipments, electrical systems in general.

The instruments, more than its cost, pays within first few inspections. The biggest advantage is the NDT without shut-downs. There are more than 100 applications already identified for plant maintenance and energy conservation in different industries like Metals, Glass, Cement, Textile, Plastic, Paper, Chemical and Petroleum, Food and Confectionary, Asphalt paving and Rubber.

Small target Non-Contact Thermometer Model C-1600 is an ideal instrument for non-destructive testing of Motors and Bearings, Engines, friction testing etc., Extrusion, Mold Control, Injection Molding, Vaccum foaming of Rubber and Plastics as applicable. It also finds application in Electronics and Pharmaceuticals industries and is vital tool of maintenance engineer to locate hot bearing, to check engine performance or to inspect steam traps etc.

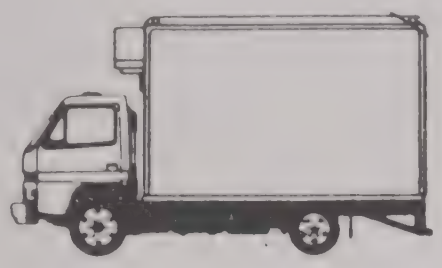
For further details, please contact:

CDCON
B-1, Shantivilla Apartments
Pratapkunj Society, Vasana,
Ahmedabad - 380 007
Tel: 0272-432397 / 430709
Fax: 0272-432397

REFRIGERATION / AIRCONDITIONING

General Airconditioning are leaders in refrigeration. They supply Refrigerated Display Units to restaurants, fast food shops, hospitals, etc. They design and build projects for dairy, Icecream, seafood, refrigerated warehousing.

Their truck and van refrigeration give high performance cooling capacity from +15°C to -20°C, and over, for use in transporting frozen food, icecream, perishable items, medicine, chemicals, etc.



For further details, write to:

General Air Conditioning Co.
16/292 Bellasis Rd.,
Bombay 400 008
Tel: 309 8635 Fax: 91-22-3072760
Tlx: 011-73471 VISH IN

ULTRAVIOLET SYSTEMS

Hitech Ultra Violet systems eliminate oxides and other contaminants in ultra pure water by using only Teflon and PVC as parts which contact water. The excellent ultra violet transmission characteristics of Teflon contains a higher ultra violet field which results in a better kill of micro-organisms.

A special water flow pattern through the Teflon tube assures turbulence and full exposures to the ultra violet rays. High turbulence and non vetting characteristics of Teflon eliminate any build-up of contaminants that could block ultra violet rays. Hence no wiper of chemical additives systems are necessary. Separation of fluid circuitry from electrical circuitry allows the lamps to operate continuously even without water. This also allows the ultra violet lamps to operate at their optimum operating temperature so they can produce optimum ultra violet light.

Hitech Ultraviolet also manufacture TOC (Total Organic Carbon) reduction sterlizers which oxides organics into carbon di-oxide gas.

Application : Aquaculture, Beverage Industries, Breweries, Dairies, Water Bottlers, R. O. Systems, Wash Water for Food products such as vegetable, fruit, fish etc. Toxic Chemical Distribution, etc. Pharmaceuticals and Cosmetics Industries, Hospitals, Laboratories, etc.

Hitech Ultraviolet manufactures sterilisers in various capacities depending on the flow rate required by each application and a maximum capacity of 12 lac. L.P.H.

For more details, write to :

Hitech Ultraviolet,
P. B. 8356
C/14 Grace Plaza, S. V. Road,
Jogeshwari (West),
Bombay-400 102.
Tel : 6286845/6282517/6244574/6244576
Fax : 6206702

HOMOGENIZERS

The company has developed high pressure Homogenizers (100% import substitute) after vigorous R & D. The company has supplied the homogenisers 200 LPH to 1000 LPH to customers like NDDB, Parle, Dukes, Cadbury and others.

Their Homogenizers are used in Dairy and Icecream Industries, Food, and Chemical Industries as well as Pharmaceutical & Cosmetic Industries.

They are shortly coming up with new product Vaccum Homogenisers and Spray Driers, Solar Cooling Systems for which they are in collaboration with Institute of Thermo Physics, Kieve, Ukraine.

For details write to :

Goma Engineering Pvt. Ltd.
LBS Marg, Majiwada,
Behind Universal Petrol Pump,
Thane (W) 400 601
Tel : 5340875 / 6436
Fax : (91-22) 5342682

ULTRAVIOLET SYSTEMS

U. V. Tech Systems are leading manufacturers of Ultraviolet Water Disinfection System, a device to sterlize the water instantly for human consumption. U.V. system is the cheapest and very effective system available for disinfecting water for potable purpose. U.V. Light at the Germicidal Wavelength of 253.7nm alter the genetic (DNA) material in cells so that bacteria viruses, molds, algae and other micro organisms can no longer reproduce. It is an assured device 99.99% bacteria/micro organism free water.

Various compact standard models are available ranging from 100 LPH to 15000 LPH. Any higher capacity model can be designed according to the requirement.

It is recommended for schools, clubs, homes, offices, factories, poultry farms, etc. for potable water and industrial houses for their various applications.

U.V. Tech Systems now introduce first time in India : POU and POE Water Technology with US tie-up. Point of use and point of entry are the new technology concept in USA.

The company also manufacture complete Water Treatment equipments like Filteration Plant, Softners, D.M. Plant, Dosing Systems and Micron Filters Package Scheme for Mineral Water Treatment.

For more details, please contact :

U.V. Tech Systems
160/3 Rajani House,
L.T. Road, Opp. Don Bosco High School,
Borivali (W), Bombay-400 091.
Tel. : 601 3601 / 601 6981
Tlx : 011-70151 SAFE IN Gram : ULTRA-SAFE

CANNING MACHINES

The Company was started by a group of Senior Engineers to meet the demand for quality Can Seaming, Reforming line and Testing Equip-

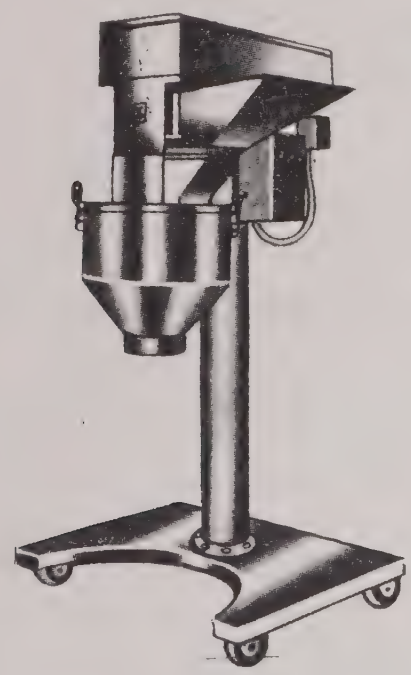
ment of international standard for Canning factories. The range of machines include High Speed rotating head, Can Stationary type Seamer having a speed of 30/25 cans per minute and range from 202 to 700 dia cans, Flat Can Body Reformer, Power/Hand Flanging machines, Power/ Food Treadle Embossing Press with Alphabats and Numerals, Flange Rectifier, Hand Can pressure tester, vaccum tester, non-destructive Pressure can tester.

For more details, contact :

Mr. A. P. Pandya
Cantech Machines .
13, Vora Bhuwan
Kings Circle, Matunga (C. Rly.)
Bombay 400 019.
Tel : 4096086 / 4096853
Fax : 91-22-4371397

MULTI MILL

M/s. United Technologie manufacture Multi Mill, which is useful for pulverising, granulations, mincing etc. generally applicable to Pharmaceutical, Chemical, Food Industries etc. Its is a compact and very efficient machine having all contact parts in S. S. 304 Quality Steel and is almost maintenance free. Different models having 0.5 to 5 H.P drives are available. All the spares available ex-stock. Machine can be made available within 4-5 days.



Multi Mill

For more information, please contact

United Technologie
Off : B 3/201, Ashokvan,
Borivali (E) Bombay 400 066.
Phone : Resi. : 851133
Fact : Parekh Ind. Estate Gala No. 10 & 19
Chandansar Road, Virar (East), Thane 380 001.

SHRINK WRAPPING MACHINE

Shrink Wrapping process involves the use off a heat shrinkable plastic film which is wrapped around an individual or group of products. The product wrapped with the film is then passed through the Shrink Wrapping machine wherein the film shrinks in area and takes the shape of the enclosed product forming a tight, compact, neat pack. Shrink wrapping is versatile enough to pack any product of any size and shape. A product as small as a pin and as big as a truck can be shrink wrapped.

The basic advantages derived from Shrink wrapping is that it is economical, involves reduction in operation time and labour, is pilfer proof packing, affords protection from weather, and gives enhanced sales appeal. It finds application for pesticides, pharmaceuticals, food products, consumer products, among others.

Aarkay manufactures a wide range of Shrink wrapping machines like Shrink chambers, Shrink tunnels, L-sealer tunnels, Web sealer tunnel, to cater to your packaging requirement, making it a simple reality.

For details write to :

Aarkay Industries,
1, Hormuzd
131, August Kranti Marg,
Bombay 400 036.
Tel : 3670537, 3675277
Gram : CRAFTWORLD

FOOD PROCESSING TECHNOLOGY

MF Marketing Pvt. Ltd. offer indigenous technology to meet international processing standards for food products reaching global markets.

Their product range includes Steam Sterilizers / Retorts, Super heated Water Spray Steriliser, Ventilator Autoclave, Stationery / Rotating Carriage Systems.

Their equipment ensures perfect thermal processing using heat trransfer application.

For details, write to :

MF Marketing Pvt. Ltd.
B-15, Arjun Centre,
B. S. Devshi Marg, Govandi,
Bombay 400 088.
Tel : 5557515 / 5560947
Tlx : MF IN 76502
Fax : 91-22-5560569

FOOD PRESERVATIVES

Ganesh Benzoplast Ltd. manufacture high quality food preservatives such as Sodium Benzoate and Benzoic Acid at their computer controlled manufacturing plant. They have been exporting these products to several West European and other Countries.

Their associate company Ganesh Anhydride Ltd. is engaged in the manufacture of Maleic Anhydride and Fumaric Acid to the tune of 10,000 and 15,000 TPA respectively. The Company is in collaboration with Scientific Design Co. Inc. USA, a world leader in Maleic Anhydride Technology.

The Maleic Anhydride plant has a 10,000 TPA capacity. GAL is also planning to launch new food chemicals like DL Malic Acid and THPA in the near future.

For more details, contact :

Ganesh Benzoplast Ltd.
Ganesh House,
Marol, Andheri (E),
Bombay-400 059.
Tel. : 838 2096 / 838 3097
Fax : 2068475

ALGINATES/GUMS

Kelco's alginates are derived from algin, the polysaccharide extracted from brown sea weeds harvested along the coast of North and South America, New Zealand and Africa. Kelco's processing and manufacturing plants are located in San Diego, California, Girvan and Barcaldine in Scotland. Kelco's alginates are world class highly standardised products. There are refined industrial and gelling grades sodium alginates, refined ammonium, refined potassium and propylene glycols alginates. Kelco also manufacture alginic acids, speciality alginates and dairy stabilizers. The alginic acids, speciality alginates and dairy stabilizers. The alginates are available in low, medium and high viscosity grades. They are used as thickeners, gelling agents, agents, emulsifying agents, stabilizing agents, water holding agents and disintegrants in food, textile, paper, explosives, ceramics, pharmaceutical and various other industries. They are sold under various trade names such as, Manutex, Manugels, Superloids, Kelmar, Dariloids, Manucol, Kelacids etc.

Xanthan gum is produced by aerobic submerged fermentation and is identical to the polysaccharide formed by the bacterium Xaanthomonas campestris. Selected Kelco xanthan gums are used in the overseas market for confectionery, dairy products like ice creams, sherbets, sour creams etc., desserts like puddings, mousses, etc, bakery goods, pie fillings, flavoured emulsions, beverages, frozen fruits, dry mixes, dietetic foods (as a partial replacement for starch), sauces, toppings etc. They are sold under the trade names of Kelzans (industrial grade) and Keltrols (food grade).

For your requirement contact,

Burzin & Leons Agenturen Pvt. Ltd.
Readymoney Building No. 1
Sir Ratan Tata Marg
Bombay 400 034
Tel: 494 4616/492 1255 Tel/Fax: 493 0283

FOOD CHEMICALS

Balaji Dye Chem are Importers & Suppliers of various chemicals ussed in Food Industries. The Company imports Pectin, used for the manufacturing of Jam, Jelly, Syrup, etc. (for setting), from Israel and are regularly supplying to various manufacturers of Jam, Jelly, Syrup, etc. all over the country.

Some of the other products they supply include: Potassium Metabi Sulphite KMS - used in various Food Industries; Citric Acid (China) - used by Soft Drink and similar industries; Cocoa Powder - used by manufacturers of Ice Creams, Chocolates, Drinking Chocolates, etc.

Balaji Dye Chem are also the Stockists and suppliers of all Food Chemicals and are supplying their products in small as well as in bulk quantities to almost all Food Industries all over the country since the year 1986.

For more details, contact:

Balaji Dye Chem
5, Prafulla Bhavan
130, Kharghat Road
Dadar, Bombay 400 014.
Tel: 561 0530/561 8554/561 1117 (Res.): 532 1303
Grams: BALAJI CHEM, BOMBAY 400 080.

WEIGHING MACHINES

The company are well known manufacturers of weighing machines, filling machines and electronic scales & systems to meet any and every need.

For details, write to:

Accurate Weighing Machines Co.
Prabhatwadi
139 Motishah Lane
P. B. No. 6958
Byculla, Bombay 400 027
Tel: 376 7308/2369 Grams: ACCUWEIGH

ASAFOETIDA

Laljee Godhoo & Co., Bombay (Branches: Madras/Kumbakonam,) manufacturers of the famous L.G. Brand Compounded Asafoetida (Bandhani Hing) have, for nearly a Century, been catering to the flavour food needs of Housewives and Hotels throughout India.

Their product is known for the Quality which has always been maintained and is Hygienically prepared and tested. And is Popular not only in India but also in foreign countries. It is exported to the Far East, Middle East, U.S.A. & U.K.

Asafoetida is used mainly in the preparation of tasty Sambhar, Rasam, Papads, Pickles and Dals. No meal is complete without L.G., the secret of good cooking.

L. G. Brand Compounded Asofoetida is available in powder form in dispenser pack bottle and L. G. Lumps in 50 g, 100 g, 200 g, 500 g.

For more details, write to:

Laljee Godhoo & Co.
213, Samuel Street
Bombay 400 003
Tel: 3421379 / 3445812.

PRODUCT REVIEWS

If you have new products and processes, send us a 120 - word write-up for free review in these pages.

"FOOD PROCESSING MACHINERY / EQUIPMENT" Special Issue

ADVERTISING RATES

Space Unit	Rate for India (Rs.)	Rate in U. S. Dollars
Full Page	4000	250
Half Page	2500	135
One-Third Page	1750	110
Quarter Page	1400	90
Colour Pages (inside) (upto 4 colours)	6500	400

Payment : Bank Draft / Cheque to favour **"THE AMALGAMATED PRESS, Bombay"**

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Space Unit	Width	Depth
Full Page	18.6 cms	24 cms
Half Page	18.6 cms	11.7 cms
One-third Page	18.6 cms	7.5 cms
Quarter Page	9 cms	11.7 cms

b. One piece Film Positive for B/W Ads or Text for typesetting

c. Complete set of progressive proofs and positive film separations for Colour Ads

Note : Above rates do not include film processing charges. This will be charged extra unless supplied.

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To:

The Amalgamated Press
Narang House, 2nd Fl.
41 Ambalal Doshi Marg
Fort, Bombay 400 023

Please publish our _____ Page Display Advertisement (B/w/Colour) in **"Food Processing Machinery Equipment" Special Issue of "Beverage & Food World" Sept. '94.** @ Rs _____ / US $ _____ nett. We enclose the following:

- ❑ Advertisement B/w Film Positive / Colour Progressive proofs / Ad Text.
- ❑ Cheque/Bank Draft for Rs. _____ / US $ _____ being cost of our Advertisement.
  [Plus Rs. 20/- (US $ 3/-) for Outstation Cheques, as bank clearing charges]
- ❑ 120 - Word Product Review for free publication in support of our Ad.

Yours faithfully

_____ _____ _____

Authorised Signatory | Designation of Signatory | Date

Name of Firm and Address _____

_____

Tel: _____ Fax: _____ Telex: _____

Products / Services _____

_____

BUYERS' GUIDE

TO SUPPLIES & SERVICES FOR FOOD / BEVERAGE INDUSTRIES

ACETIC ACID

A. B. Enterprises -- See under "Citric Acid".

Balaji Dye Chem, -- See under "Acids".

Olin Chemicals, A-303 Padmavati Nagar, Gen. Arunkumar Vaidya Marg, Goregaon (E), Bombay 400 063. Tel : 8406988, 8413111 Fax : 8734332

ACIDS

Ascorbic, Citric, Maleic, Benzoic, Fumaric, Muriatic, Phosphoric, Tartaric, Gibberellic, Tannic USP & Tech. etc.

B. I. Mehta, 2-B, Ganga Vihar, 94, Kazi Sayed St., Bombay 400 003. Tel: Off : 344 5506 / 344 7879 Res: 644 2063 Tlx : C/o. 11-75617 MMCB IN Attn.: B. I. Mehta. Fax : 00-91-22-8552708.

Balaji Dye Chem, 5, Prafulla Bhavan, 130, Khareghat Rd., Dadar, Bombay 400014. Tel: 5610530 / 5611117 / 5321303 (R). Gram : BALAJI CHEM. Bombay 400 080.

Citurgia Biochemicals Ltd., Neville House, J. N. Heredia Marg, Ballard Estate, Bombay 400 038. Tel: 2618071. Gram: CITURGIA,. Bombay. Tlx : 11-86472 BOM IN

M. M. Chemicals, 2/2, 1st Cross, A. S. Char St., Bangalore 560 053.

Sesu Trading Corporation, 4th Flr., Sai Chambers, 367/369, Narsi Natha St., Bombay 400 009. Tel: 3420832/3426402. Telex : 11-72247 Fax: 11-3420832.

Thirumalai Chemicals Limited, Maalavika Centre, 5th Floor, 144, Kodambakkam High Road, Madras 600 034. Tel: 8255755 Tlx: 041-5415 TCL IN.

ADDITIVES, FOOD & BEVERAGE

B.I. Mehta -- See under "Acids".

Burzin & Leons Agenturen Pvt. Ltd., Readymoney Bldg. No. 1, Sir Ratan Tata Marg, Tardeo Rd., Bombay - 400 034. Tel : 4944616, 4921255. Tele/Fax : 4930283

Ganesh Benzoplast Ltd., Ganesh House, Marol, Andheri (E), Bombay 400 059. Tel: (91) (22) 8382096/8383097/8384548. Tlx: (081) 011-79164/83906 GNES IN. Fax: (91)(22)2068475/8391529.

Mittal Agency, 3, Rai Gopal Shankar Lane, Naya Bazar, Bhagalpur 812002. Tel : 20724.

Olin Chemicals -- See under "Acetic Acid".

Sesu Trading Corporation, -- See under "Acids".

Thirumalai Chemicals Limited -- See under "Acids".

Vidarbha Fruit Products Pvt. Ltd., B/5, Rajdarshan, Opp. Platform No.6, Thane (W). Tel : 504782, Fax : 539233.

Vin Flavours 'Viniketan' 1, Krishna Society, Hari Bhakti Extn., Old Padra Rd., Baroda 390 015. Tel: 541196/322048. Gram: VINFLA.

ADHESIVES / ADHESIVES TAPES

Liston Laghu Udyog -- See under "Pickle Cutting & Slicing Machine".

Polypak Products, 71/C Sundar, N. G. Acharya Marg, Chembur, Bombay 400 071. Tel : 5513727/ 5519736

ADHESIVES, HEAT RESISTANT

Manikant Brothers -- See under "Anti-Corrosion Chemicals".

ADHESIVE TAPES, PTFE, GLASS

Unnati Corporation, 423-425, GIDC Tele. Exch. Lane, Odhav, Ahmedabad 382 415. Tel: 873434 / 872277 Tlx: 121-6816 ANAR IN Fax: 272-366505.

AGAR AGAR (POWDER/ STRIPS)

Amit Fine Chem, 14, 3rd Dharia House, Opp. Vinod Silk Milk, Ashok Chakravati Rd., Kandivli (E), Bombay 400101. Tel : 612 7988 / 889 1730.

Parul Enterprises, Dharia House, Top fl., Opp. Vinod Mill, A. C. Road, Kandivli (E), Bombay 400101. Tel : 6127988/8891730

AGITATORS

Cosywo Engineering Co., -- See under "Chemical Plant & Equipment".

Fabdecon Engineers, 138, Damji Shamji Ind., Complex, Off. Mahakali Caves Rd., Andheri (East), Bombay 400 093. Tel: 8347952 / 8343179. Grams: VACFILTER, Ghatkopar, Telex: 011-79194 FABD-IN.

Frigmaires Engineers, Janta Ind. Estate, Gala No. 8, Tulsi Pipe Road, Lower Parel, Bombay 400 013. Tel: 4945624/4926159. Tlx : 011-75984 FRIG IN.

Lara Engineers, 19 Arunoday, Alkapuri, Baroda 390005. Tel : 323157 / 327269.

Mamko Process Equipments -- See under "Emulsifiers".

United Technologie, -- See under "Conveyors".

AIR BLOWERS

Indcon Polymech Limited, 311, Mansarovar, 90, Nehru Place, New Delhi 110 019. Tel: 6431908/ 6436869/6438365. Telex: 031-61678 Fax: 11-6464994.

AIRCONDITIONING/ REFRIGERATION PLANT & EQUIPMENT

Advance Equipment Company, Navjivan Society, Building 3/2/7, Bombay Central, Bombay 400 008.

National Refrigeration Works -- See under "Refrigeration Equipment".

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Fax : 11-3420832

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Bombay - 400 009.

Refcon Engineers, 4 Little Gift, Plot 641, 19th Road, Khar (W), Bombay 400 052. Tel : 542291

Saffaire India, 51, Juhu Supreme Shopping Centre, Gulmohar Cross Rd No. 8, J.V.P.D. Scheme, Bombay 400 049. Tel. 6203998. Cable : SAFRIGE

Transair, 27/A Laxmi Indl. Estate, Off Linking Rd., Andheri (W), Bombay 400 058. Tel : 6269292/ 6293514 Fax : 91-22-6269292/91-22-6268844

AIR CURTAINS

Air Frige Industries, 10/66 Kirtinagar Indl. Area, New Delhi 110015. Tel: 531972. Gr.: FRIGDAR.

AIR DRIERS

Sakav Enterprises, 12/82, Govind Nagar, Sodawala Lane, Borivali (West), Bombay 400 092. Tel: 8010250.

AJINOMOTO

Ace International -- See under "Guar Gum".

Balaji Dye Chem -- See under "Acids".

Sesu Trading Corporation -- See under "Acids".

ALUMINIUM FOIL

India Foils Limited, 4, Mangoe Lane, Calcutta 700 001.

ANALYSERS

Technovation, 4 Paramel, St. Cyril's Rd., Bandra, Bombay 400 050.

ANTI-CORROSION CHEMICALS

Manikant Brothers, 311, New Anant Bhuvan, 257/65 Narsi Natha St, Bombay 400 009. Tel: 375 2881 /375 6977. Telex: Care-011-74491 TEXOIN. Fax: Care 91-22 3750388

ANTI-OXIDANTS

Elegant Enterprises, 502, Cotton Exchange Building, Kalbadevi Road, Bombay 400 002. Tel: 312362 Gram: Elanand.

Olin Chemicals -- See under "Acetic Acid".

Sesu Trading Corporation -- See under "Acids".

Vini-Chem Laboratories, 5, Girdhari Bhavan, 48, A/B Sadashiv Cross Lane, Bombay 400 004. Tel: 358578. Gr. FORMALIN

AROMATIC CHEMICALS

Aroma Industries, B-150, DDA Shed, Okhla Industrial Area, Phase -II, New Delhi 110020.

Bush Boake Allen (India) Ltd., -- See under "Essences & Flavours".

Gupta & Company Ltd. -- See under "Essential Oils".

Harish C. Khosla & Co. -- See under "Essences & Flavours"

Olin Chemicals., -- See under "Acetic Acid"

Sesu Trading Corporation -- See under "Acids"

Sonarome Chemicals Pvt. Ltd., No. C-136, Peenya Indl. Area, Peenya 2nd stage, Bangalore 560 058. Tel: 8394804/8395595. Fax: 3334802/2200016. Tlx: 845-8848.

ASAFOETIDA (HING)

Amruth Food Products, 5/1, 4th Main Rd., Jayanagar, Mysore 570014. Tel: 0821-26990 Tlx: 0846-328 CBFX IN.

Laljee Godhoo & Company, Rang Mahal, 212/216, Samuel St., Bombay 400 003. Tel: 3421379 / 3445812 Tlx: 11-85214 VJAY IN, Fax : 91 (22) 3431742.

ASEPTIC FLUID HANDLING SYSTEMS

Sanitech Engineeers, 107, Vardhaman Complex, Fitwell House Compound, L. B. S. Marg, Vikhori (West), Bombay 400 083. Tel : (022) 5785139. Telex : 11-71978 BOEX IN. Tel : (022) 5785139.

ASEPTIC PACKAGING

Indec Equipment Pvt. Ltd., 105 Veena Indl. Estate, Off Veera Desai Rd., Andheri (W), Bombay 400058 Tel : 8267519 Fax : (091) 22-8267519

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Automatic Devices, 105-A, Hind Saurashtra Industrial Estate, Marol Naka, Bombay 400 059. Tel. 8321376. Tlx : C/o. 011-78468 SAI IN. Fax : (91-22) 8351514.

AUTOCLAVES

Fabdecon Engineers -- See under "Agitators".

M. F. Marketing Pvt. Ltd., B-15, Arjun Centre, B. S. Devshi Marg, Govandi, Bombay 400 088. Tel : 5557515 / 5560947. Fax : 01-22-5560569.

Pushkaraj Enterprises -- See under "Fluid Extraction Plants".

United Technologie -- See under "Conveyor".

AUTOMATIC FORM-FILL - SEAL MACHINES

Unique Flexo Packaging, Gala No. B-270, Off Kasturi Plaza, Joshiwadi, Dombivli (E), 421 201. Tel.: 5785723.

AUTOMATION SYSTEMS

Tata Honeywell Limited, Hadapsar, Pune 411 013. Tel: 0212-675532/4/5, Tlx. : 0145-7324 Fax : 0212-675992

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Plasto Pack, B-15 Mugappair (W) Industrial Estate, Behind Wavin, Madras 600 050. Tel. 655203/656283.

Shaco Enterpries, 161 Raja Ram Mohan Roy Rd., Prathana Samaj Corner, P. O. Box 3635, Bombay 400 004. Tel : 3864646 / 352343. Fax : 022-3630739.

BAKERY / BISCUIT EQUIPMENT

Admir Engineers, Plot No. 1/E-4 Shivaji Nagar, Govandi, Bombay 400 043. Tel : 5511718/5568446/ 5518182.

Advance Equipment Company -- See under "Airconditioning/Refrigeration Plant & Equipment".

Continental Equipment India Pvt. Ltd., 1E/1 Jhandewalan Extension, Link Rd, New Delhi 110 055. Tel: 521282 & 7524767. Cable: Efficient. Tlx: 031-66706 CANT IN. Fax : 011-7524767

Fabdecon Engineers -- See under "Agitators".

Frigmaires Engineers -- See under "Agitators".

Grovers Private Limited, 228, Kaliandas Udyog Bhavan, Near Century Bazar, Bombay 400 025. Tel: 4303223 / 4309935 / 4309467. Tlx: 011-71672. GRIN IN. Cable GROFROST.

J. M. B. Engineering Works, Shop No. 2, Shed No. 3, Kodivitta Road, Behind Diamond Restaurant, Andheri (E), Bombay 400 059. Tel: 8363113/8380538.

Mangal Metal Works, Near Rly. Bridge, Khanapur Road, Belgaum 590001 (Karnataka). Tel: 21877, Gram: BAKEWELL

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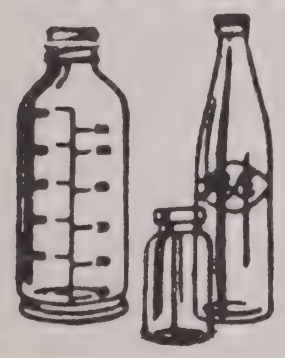

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Sakav Enterprises -- See under "Air Driers".

Sudershan Industries, 563, Guruwar Peth, Kasture Chowk, Pune 411042. Tel : 446885.

BAKING POWDER

Ajmera Chemical Works, 6/104, Garodianagar, Ghatkopar (E), Bombay 400 077. Tel: 8129212 / 8110114.

Lakh Enterprises, 182, Yusuf Meherali Road, 1st Floor, Bombay 400 003. Tel : 3720957, 3756498. Tlx : 011-7509 PLOIN (ICT 85) Gram : 'BRISTAFOOD'.

Sesu Trading Corporation -- See under "Acids"

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Ratnajeet Polycon Ltd., 2, Jawahar Nagar, S.V. Road, Goregaon (West), Bombay 400 104, Tel 8727479 / 8727480, Fax : 91-22-873 7071.

BATCH CODER

Codex Enterprises, 601 'A' Block, 6th fl., B.G. Towers, O/S Delhi Gate, Ahmedabad 380 004.

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Thermax Limited, Chinchwad, Pune 411 019. Cable: THERMAX Fax: 0212-772049.

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Interrol (India) Pvt. Ltd., 17, Community Centre, Mayapuri, Phase - I, New Delhi 110064. Tel.: 531311, 531407, Fax 504841. Tlx : 031-76072 SMP IN.

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Unnati Corporation -- See under "Adhesive Tape, PTFE, Glass".

BENZOIC ACID

Ganesh Benzoplast Ltd.-- See under "Additives, Food & Beverage"

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Amit Fine Chem. -- See under "Agar Agar (Powder / Strips)".

Olin Chemicals -- See under "Acetic Acid".

Parul Enterprises -- See under "Agar Agar (Powder / Strips)"

Sesu Trading Corpn. -- See under "Acids".

BHATTIES, KEROSENE/ DIESEL

Liberty Industries A-1/3 Shivaji Indl. Assoc., Vakola Bridge, Santacruz (East), Bombay 400 055. Tel: 8365774/8375887/6120301.

BISCUIT MAKING MACHINES

Frigmaires Engineers -- See under "Agitators".

Mangal Engineering Works, Factory Area, Patiala 147 001, Pb. Tel: 74169/77206. Grams: MANGAL. Telex: PCO-216.

Nagpal Brothers (Regd) -- See under "Bread Plant".

BLENDERS & MIXERS

Cosywo Engineering Co. -- See under "Agitators"

Fabdecon Engineers -- See under "Agitators".

Frigmaires Engineers -- See under "Agitators".

Mamko Process Equipment Manufacturers -- See under "Emulsifiers".

United Technologie -- See under "Conveyor".

BLISTER FOIL

Imperial Packaging Products, 720 Cotton Exchange Bldg., Kalbadevi Road, Bombay 400 002. Tel : 2054810/205 8391

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Elmach Packages (India) Pvt. ltd., 410 Hill View Indl. Estate, Off. L.B.S. Marg, Ghatkopar (W), Bombay 400 086. Tel: 275676/276184.

Package India, W-115A, 111 Avenue, Anna Nagar, Madras 600 040. Tel: 6214555.

BOILERS

Cinni Engineering Pvt. Ltd., 'Rainbow Indl. Estate, Behind Arvind Works, 'Vyaravali', M. I. D. C., Andheri (E), Bombay 400 093. Tel: 8328887/ 8300278 Gr: TECHITHERM.

Compact Boilers Pvt. Ltd., 44, Yusuf Building, 4th Floor, Veer Nariman Road, Bombay 400 023. Tel: 2049669/2042001./2044592 Gram : COFTISOLER.

Energy Machine, C1, B/423, G.I.D.C. IV Phase, Vithal Udyog nagar, Vallabh Vidyanagar, Gujarat 388 121. Tel: 31493.

Fuelpac Boilers & Engg. Co. (I) Pvt. Ltd., H-94 Gujarati Society, Nehru Rd., Vile Parle (E), Bombay 400 057.

Jaya and Company, Boiler Engineers, 30, PNR Naidu Layout, Trichy Road, P.B. No. 3740, Coimbatore 641 018 (Tamil Nadu). Tel: 23994/26416. Grams : Boiler. Telex : 855/381 JAYA IN.

Kalpana Boilers and Chemical Plants Mfg. Co., 18, Kailas Park, Chirag Nagar, L. B. S. Marg, Ghatkopar (W), Bombay 400 086. Tel: 5125352/5129796.

Maxima Boilers Pvt. Ltd., G-14, Meghal Service Indl. Estate, Devidayal Road, Mulund West, Bombay 400080 Tel: 5612759.

Ross Enterprises, 33, Burhani Indl. Estate, Kondhwa BK, Pune 411 048. Tel: 676518/652210

Soft-Dion Water -- See under "Demineralizers".

Watrion Water & Filter Engg. Pvt. Ltd., 1 Harishivam Apts., Behind New Canara Bank, Andheri West, Bombay 400 058. Tel : 6247200 Grams : WATERFALL

BOILER FEED PUMPS

Raj Pumps, P. O. Box 90, M. I. Rd., Jaipur 302001 Tel : 372308/ 372949

BOPP PACKING TAPES

Acme Packaging, 10, Topiwalla Mansion, 1st Fl., Above Patel Restaurant, 93/97 Mohamadali Road, Bombay 400 003. Tel: (Off.) 3432601 (Resi) 8725294

Polypak Products -- See under "Adhesives/Adhesive Tapes".

BOTTLE CLOSURE MACHINERY

Advance Packaging, 10/65, Industrial Area, Kirti Nagar, New Delhi 110 015. Tel: 53 2388/ 541 0629 (R) 544 8110/544 9347.

Larsen & Toubro, Packaging Section, 32 Shivaji Marg, P. O. Box 6233, New Delhi 110015.

BOTTLE FILLERS

Fillopack Industries, Unit No.2, Vijay Indl. Estate, I. B. Patel Road, Goregaon (E) Bombay 400 063.

Rita Bottling Machines Pvt. Ltd., 55, III Main Rd., Gandhinagar, Adyar, Madras 600020. Tel : 412698/419029 Tlx : 41-21045 RITA IN

Unique Flexo Packaging -- See under "Automatic Form-Fill-Seal Machines".

BOTTLES & JARS, GLASS

A to Z Bottle Suppliers, 10A Pais Street, Clerk Rd., Stable No. 4, Byculla West, Bombay 400 011. Tel : 3082381 / 3727241

Divecha Glass Industries, 155, Maker Chambers VI, 220 Nariman Point, Bombay 400 021. Tel: 241157/241167

R.G. Glass Agency, 244, Maulana Azad Road, (North) Opp Urdu Times, Post Box No. 4564, Bombay 400 008. Tel: 307236/ 3086984/3099896/3096218. Grams: SUPERGLASS

Star Glass Works, 299, Kurla Andheri Road, (Jari Mari), Bombay 400 072. Tel: 5111211/ 5111827/8. Cable: STARBOTTLE. Fax : 011-73345 SGW IN.

BOTTLE INSPECTORS

J.T. Jagtiani -- See under "Machinery, Food & Beverage Processing"

BOTTLING PLANTS

Dairy Udyog, C-229A, Ghatkopar Ind. Estate, L. B. S. Marg, Ghatkopar, Bombay 400086. Tel: 586878/583636. Grams: DAIRYUDYOG. Bombay - 86.

Frigmaires Engineers -- See under "Agitators".

Geeta Food Engineering -- See under " Food Processing Equipment/Plants."

Hilden Packaging Machines Pvt. Ltd., Plot 101 Rd., 16, MIDC, Marol, Andheri (E), Bombay 400 093. Tel: 8322251/8329193/ 6329263. Grams: PACK BOTTLE.

J. T. Jagtiani -- See under "Machinery, Food & Beverage Processing".

Liberty Equipments P. Ltd. 373, SIDCO Industrial Estate, Ambattur, Madras 600 098. Tel: 044-655081. Fax: 91-44-869900.

Technology Plastics Ltd. -- See under "PET Bottles".

The Master Mechanical Works Pvt. Ltd., Pushpanjali, S.V. Road, Santa Cruz (W), Bombay 400 054. Tel: 6493459/6491680/6490619.

Gr. : ROLLSEALER.

BOTTLE WASHERS & RINSERS

Acmevac Sales Pvt. Ltd., 109, Unique Industrial Estate, Cardinal Gracias Road, Chakala, Andheri (E), Bombay 400 093. Tel: 8329647/8300619.

BOTTLE WASHING MACHINES

The Royal Scientific Industries, 22, Sarojini St., T. Nagar, Madras 600 018. Tel : 443821. Fax : 91-44-837372.

BOX MAKING MACHINERY

Paper Board Machinery Co., Plot No. 115, D.L.F. Industrial Area, Part-I, Faridabad 121003, Haryana. Tel : 011-8275394/011-8275894. Gram : Paper Board Faridabad. Fax : 011-8275394.

BOX STITCHING MACHINES

Venus Industries, B-6 Mayapuri Phase-II, New Delhi 110064. Tel : 5403148/5401321, Tlx : 3176252 KRF-IN Grams : STITCHERS, Fax: 011-5436957.

BREAD KNEADING MACHINE

Fabdecon Engineers -- See under "Agitators".

J.M.B. Engineering Works -- See under "Bakery/Biscuit Equipment".

BREAD PLANT

Nagpal Brothers (Regd.) 2789, Hamilton Rd., (Zorawar Singh Marg), Mori Gate, Delhi 110 006. Tel: 2518412/2911888, Cable: NAGBAKERY Fax: 011 2923059.

BREWERY PLANT & EQUIPMENT

Chemi Filter Corporation, 1/C-16, "Geebee", Apartments, Sai Baba Nagar, Borivli (W), Bombay 400 092.

Flocon Industries, 542, Akurli Road, Fonseca Compound, Near Old Post Office, Kandivali (E), Bombay 400 101. Tel: 8886265.

CAKE MIXING MACHINES

Fabdecon Engineers -- See under "Agitators".

Frigmaires Engineers -- See under "Agitators".

J.M.B. Engineering Works -- See under "Bakery/Biscuit Equipment".

CALCIUM ALGINATE

Burzin and Leons Agenturen Pvt. Ltd. -- See under "Additives, Food and Beverage"

CALCIUM CARBONATE

Citurgia Biochemicals Ltd. -- See under "Acids".

CAN CLOSING & SEAMING MACHINES

Cantech Machines, 13, Vora Bhavan, King's Circle, Matunga (C. R.), Bombay 400 019. Tel: 4096086 / 4096853. Fax: 91-22-4371397

Ganga Singh Sukhwinder Singh & Sons -- See under "Canning Machinery & Plants".

Recon Machine Tools Pvt. Ltd., 35, Sarvodaya Industrial Estate, Mahakali Caves Road, Bombay 400 093. Tel: 400 093. Tel: 8344973/834393]1.

CAN FILLING MACHINERY

Unique Flexo Packaging -- See under "Automatic Form-Fill-Seal Machines"

CANDY PACKING MACHINES

New Indo International -- See under "Food Processing Equipment/Plants

CAN TESTERS

Recon Machine Tools Pvt. Ltd. -- See under "Can Closing & Seaming Machines".

CANNING MACHINERY & PLANTS

Ganga Singh Sukhwinder Singh & Sons, 1 Vishal Ind. Estate, Village Rd., Bhandup (W), Bombay 400 078. Tel.: 5600562 / 5649312 Fax : 0091-22-5649312

CANS & CONTAINERS

Standard Tin Works -- See under "Caps & Closures".

The Tinplate Co. of India Ltd., Golmuri, Jamshedpur 831 003 Tel: 25796. Gram: TINPLATES.

CAPPING EQUIPMENT

Frigmaires Engineers -- See under "Agitators"

United Technologie -- See under "Conveyor".

CAPPING MACHINES

Autopack Machines Pvt. Ltd., 101-C, Poonam Chambers, 1st Fl., Dr. Annie Besant Road, Worli, Bombay 400 018. Tel: 4924926.

CAPS & CLOSURES

Standard Tin Works, Standard House, D'Souza Compound, Safed Pool, Kurla-Andheri Rd., Bombay 400 072. Tel: 5112758/5125605/5150975, Tlx : 011-73566 LALA IN, Fax : 91-22-5134851.

CARAMEL FOOD COLOUR

Flavour India Private Ltd., C-5, 14 & 23, Pipdic Industrial Estate, Pondicherry - 605 009. Tel: 27833.

Konam Enterprises, 135 Pantnagar, Opp. Ghatkopar (E) Stn., Bombay 400075. Tel : 516-5345 / 511-1853.

Tajir Private Ltd., Adie Mansion, 334 Maulana Shaukatali Rd., Bombay 400 007. Tel. : 3073314, 3078776, Fax : 3072757. Tlx : 011-75809 ALIF IN.

CARBON DIOXIDE GAS GENERATING SYSTEMS

Deltech Engineering Pvt. Ltd., Luz Ginza, Shantivihar Complex, 140, Royapettah High Road, Madras 600 004. Tel: 77288.

CARBOYS

B.K. Polyplast (A Divn. of B.K. Paper Mills Pvt. Ltd.), 1301-1318, Dalamal Tower, 211, Nariman Point, Bombay 400 021. Tel: 2834906/2834995.

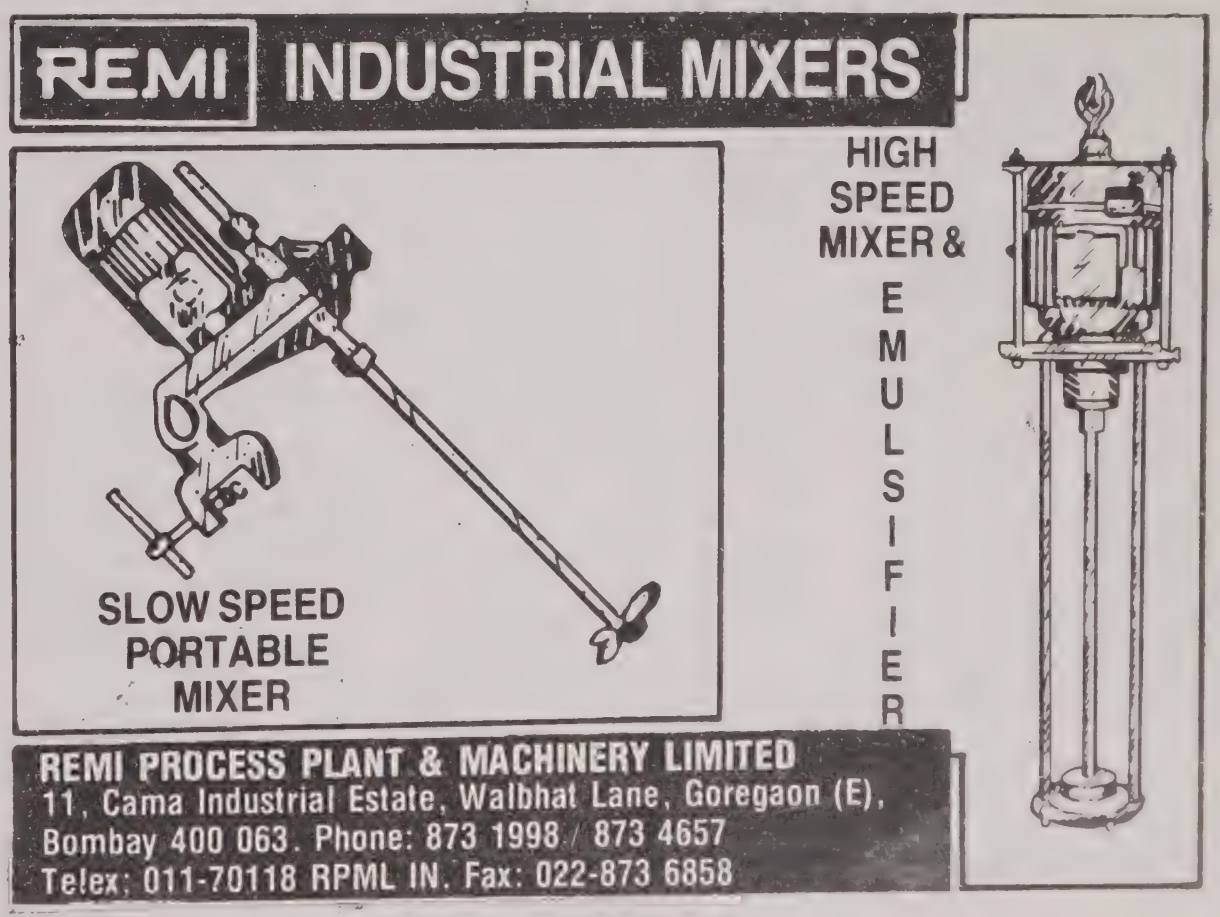
CASEIN

Classik Casein, 178/10, Chandreshwar Bhavan, Sion Main Road, Sion (West), Bombay 400022. Tel : 4071318.

Lacto Protein India Ltd., D-17 Panch shila Enclave, New Delhi - 110 017. Tel : 91-11- 6442474/6450337 Tlx: 31-70098 ACE IN. Fax: 91-11-6410493

S. P. Jagdish & Co., 1222, Stock Exchange Towers, Dalal Street, Fort, Bombay 400 001. Tel: 271212/271717. Grams: CASIN-MAKER. Tlx: 011-85629.

Venus Casein Products, 170,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Telex: 011-70118 RPML IN. Fax: 022-873 6858

G.I.D.C Estate, Mehsana 384002, N. Gujarat. Tel : (O) 22121 (R) 22566.

CATERING EQUIPMENT

Bhagwati Udyog, A-55, Wazirpur Indl. Area, Post Box No. 8488, Delhi - 52. Tel.: 741445, Fax:91-11-733-4544.

CELLULOSE PRODUCTS

Sesu Trading Corporation -- See under "Acids".

Uttam Corporation, 194, 10th Rd., Khetwadi Main Rd., Bombay 400 004. Tel : 357488/3870568/ 356466 / 3883089 Grams: UTTAMCHAND. Tlx : 11-71567 UTTM IN Fax : 22-387-0461

CENTRIFUGES

Filtron India, Sparc, 117-A, Vithalwadi Road, Pune 411 030. Tel: 440068/444079. Grams : NORTLIF. Telex: 0145-323 TRON IN. Fax : (0212) 440068.

Frigmaires Engineers -- See under "Agitators"

Kalpana Boilers & Chemical Plants Mfg. Co. -- See under "Boilers".

CHEMICALS, FINE

Balaji Dye Chem -- See under "Acids"

M. M. Chemicals -- See under "Acids"

Olin Chemicals -- See under "Acetic Acid".

Sesu Trading Corporation -- See under "Acids".

Thirumalai Chemicals Limited -- See under "Acids".

Uttam Corporation -- See under "Cellulose Products"

CHEMICAL PLANT & EQUIPMENT

Cosywo Engineering Company, 15 Laxmi Co-op. Indl. Estate Ltd., Near Nagarvel Hanuman Mandir Amraiwadi Road., Ahmedabad 380026. Tel.: 368168 (Res: 418857) Gram: Cosywo

Fabdecon Engineers -- See under "Agitators"

Frigmaires Engineers -- See under "Agitators"

Murarka Private Ltd., A/55 Capital Commercial Centre Bldg., Ashram Rd., Ahmedabad 38009

United Technologie -- See under "Conveyor"

CHILLING PLANTS

Grovers Private Ltd. -- See under "Bakery/Biscuit Equipment"

CHLORINATORS

Chloro Control Equipments Co., 13/M-E Laxmi Industrial Estate, New Link Rd., Andheri (W) Bombay 400 058. Tel.: 8266891. Tlx: 011-78092 KOCH-IN, Gr. ADVANCE.

CHOCOLATE MAKING MACHINES

Fabdecon Engineers -- See under "Agitators"

Frigmaires Engineers -- See under "Agitators"

Standard Machinery Marketing Co. Pvt. Ltd., Shanthi Bldg., No. 43 Mount Rd., Madras 600 002. Tel : 044-830385 Fax : 91-44-830384

CITRIC ACID

A. B. Enterprises, 209/5676 Anitakutir 'C' Pantnagar, Ghatkopar (East), Bombay 400 075. Tel.: 5163386.

Ace International -- See under "Guar Gum".

Alok Chem Corporation -- See under "Guar Gum".

Balaji Dye Chem -- See under "Acids".

B. I. Mehta -- See under "Acids".

Citurgia Biochemicals Ltd. -- See under "Acids".

Sesu Trading Corporation -- See under "Acids".

CITRIC ACID / ANHYDROUS

Amit Fine Chem. -- See under "Agar Agar (Powder/Strips)"

Olin Chemicals -- See under "Acetic Acid"

Parul Enterprise -- See under "Agar Agar (Powder/strips)".

Sesu Trading Corporation -- See under "Acids".

CLARIFICATION SYSTEMS

Krofta Engg. Ltd., S.C.O. 55, Madhya Marg, Sector 26, Chandigarh 160 019. Cable : Krofta, Chandigarh. Tel : 22115/ 22124.

CLEANING / GRADING MACHINERY

Goldin (I) Equipment Pvt. Ltd., 1st Floor, Saraswati Estate, Opp. Chhana Jakat Naka, Vadodara 390 002. Tel : (0265) 21452 / 21949. Fax : 0265-21452.

COCOA BUTTER

Cadbury India Ltd., Cadbury House, 19 Bhulabhai Desai Road, Bombay 400 026. Tel: 361476

COCOA POWDER

Balaji Dye Chem -- See under "Acids"

Cadbury India Ltd. -- See under "Cocoa Butter".

Olin Chemicals -- See under "Acetic Acid"

Sesu Trading Corporation -- See under "Acids".

CODING / NUMBERING MACHINES

Numerators India, 3/6 Marris Road, Mendu Compound, Aligarh 202001. (U.P) Tel : (0571) 25910. Grams : NUMERATORS.

COLD STORAGE PLANT

Air Frige Industries -- See under "Airconditioning/Refrigeration Plant & Equipment".

'METACOLOR', Shree Precoated Steel Ltd. -- See under "Refrigeration Equipment & Plant".

Transair -- See under "Air Conditioning/Refrigeration Plant & Equipment".

COLOURS, FOOD & BEVERAGE

Asim Products -- See under "Food Colours, Food & Beverage".

Devarsons Pvt. Ltd. Shreeji Niwas, Astodia Road, Ahmedabad 380 001. Tel: 342796/345599.

Hickson & Dadajee Limited, Shree Pant Bhuvan, Mamasaheb Warerkar Bridge, Bombay 400 007. Tel.: 3633968 / 3634760 Tlx: 11-75384.

L. B. Aroma & Chemicals -- See under "Essential Oils".

Sesu Trading Corporation -- See under "Acids".

Vino Synth Chem Pvt. Ltd. -- See under "Food Colours"

COMPOSITE CONTAINERS (LEAK PROOF)

Consolidated Containers (I) Ltd., 8, Anupam Indl. Est., 2, L.B.S. Marg, Mulund (W), Bombay 400080. Tel: 5614902, 5618942 Fax: 0091-22-261-2659 (CCIL)

CONCENTRATES & EXTRACTS

Agro Foods Punjab Ltd., Seed Farm Road, Abohar 152 116. Tel: 21415. Grams: FARMAID

Fabdecon Engineers -- See under "Agitators"

Gupta & Company Ltd. -- See under "Essential Oils"

CONFECTIONERY MACHINES (See also under "Machinery, Confectionery")

Eskeyar Engg. Co. (P) Ltd., 10/ 5 Developed Plot, Ambattur Indl. Estate, Madras 600 058. Tel : 654137 / 652369. Fax : 499 1447.

CONSULTANCY & DESIGN

Agro Hi-Tech, 23 New Rajamandi Colony, Agra 282002. (Agro-based / Mushroom Cultivation)

Dr. T. K. Food Consultants, 2A, 4th Floor, Lentin Chambers, Dalal Street, Fort, Bombay 400 023. Tel: 2657206/2651864.

Scope Marketing Pvt. Ltd., 30/ 1 South Boag Rd., T. Nagar, Madras 600 017.

Subhash Gupta & Associates, C-430 East of Loni Rd., Shahadra, Delhi 110 093. Tel : 2294730.

CONTAINERS, PET/ PLASTIC/METAL

Gaurav Containers Ltd., Kaker Chamber V, 1412, 13th Floor, Nariman Point, Bombay 400 021.

Pearl Polymers Limited, F-44, Bhagat Singh Market, (Near Gole Market), New Delhi 110 001. Tel: 351152/351160 Tlx: 031-65493 PARL IN. Fax: 011-331-1601.

Swastik Industries 34/C, Thakker Building, Ground Flr., Gala No. 4, Champsi Bhimji Road, Next to Shrinivas Bldg., New Post Office, Old Anjirwadi, Mazagaon, Bombay 400 010 Tel: 8729366.

Technology Plastics Limited -- See under "PET Bottles".

CONTAINERS & CUPS, DISPOSABLE

Circle KS Polyset Industries Pvt. Ltd., 114, 4th Hindu Colony, Bombay 400 014. Tel : 4145094/ 4142869 Tlx: 011-75490 CKS IN.

Tropical Cups & Containers 16/76, Gokuldas Pasta Road, Next to Hotel Red Rose, Behind Chitra Cinema, Dadar (E), Bombay 400 014. Tel: 4137843/44/45.

CONTRA-ROTARY MIXER

Cosywo Engineering Company -- See under "Chemical Plant & Equipment

Metal Plants, 2/17, Anupam Ind. Estate, Lal Bahadur Shastri Marg, Mulund, Bombay 400 080. Tel:

5614439/5610628.

CONTROLLERS

Flow, Liquid Level, Temp. Misc.

Sakav Enterprises — See under "Air Driers".

CONVEYOR, ROLLER

Ferro Foundries Private Ltd., Yelwal Road, Belvadi P.O., Mysore 571186, S. India. Tel: 42376 Gr: FOUNDRY Tlx: HUNSPLY 0846-224

Interroll (India) Pvt. Ltd., Joki Division, 17, Community Centre, Mayapuri Phase I, New Delhi 110 064. Tel: 531311/531407/500109

CONVEYER BELTS & CHAINS

Wiperdrive Engineering, Noble Chambers, 11 Janmabhoomi Marg, Fort, Bombay 400 001. Tel : 2871995/2871855 Fax: 022-287-3597

CONVEYORS

United Technologie, B3/201, Ashokvan, Borivli (E), Bombay 400 066. Tel: 851133. Fact: Parikh Ind. Estate, Gala No. 2, 10 & 19, Chandansar Road, Virar (E), 380 001.

COOLING TOWER PUMPS

Raj Pumps—See under "Boiler Feed Pumps"

CORK LINERS

Vora Cork Industries Pvt. Ltd., Lobo Compound, Opp. Tip Top Hotel, Sakinaka, Bombay 400 072. Tel: 46342/43, Fax: 91-22-5125370.

CORROSION INHIBITORS

Manikant Bros. — See under "Anti Corrosion Chemicals".

CRATES, PLASTIC

A-1 Plastics — See under "Containers,PET/Plastic/Metal".

Bright Brothers Limited, 35-C, Pt.M.M.Malviya Rd., Bombay 400 034 Tel : 4945342-46 Tlx : 011-75066 IN Fax : 022-4947596

Fine Plast Industries Pvt. Ltd., Sales Off: 85, Sarang St., Taher Bldg., 1st Floor., Bombay 400 003. Tel: 2999129/256734. Tlx: NPAI 011-3818-IN. Gr: "POLY-DRUMS".

Nilkamal Crates & Containers, 5, Rewa Chambers, 1st fl., New Marine Lines, Bombay 400 020 Tel: 255746/79, 295251. Cable : CRATES.

V. I. P. Industries Ltd., Leo House, 5th fl., 88-C Prabhadevi Rd., Bombay 400 025.

CREAM FILLING MACHINE

Frigmaires Engineers — See under "Agitators"

United Technologie — See under "Conveyor"

CREAM SEPARATOR

Naveen Scientific Industries, Post Box 67, Lactowin House, Near B. D. School, Ambala Cantt. Tel 643092, 24591. Gram : LACTOWIN

Sinhal Metal Industries Pvt. Ltd., C-56-1 Wazirpur Indl. Area, Delhi 110 052. Tel : 7114375 / 7121971. Gram : LISTERMAKE.

CREAM OF TARTAR

Alok Chem Corporation, 406, Goradia House, P.O.B. 13048, 100/104, Kazi Syed Street, Bombay 400 003. Tel: 326390/325365 (R) 5610002/6238090.

Amit Fine Chem. -- See under "Agar Agar (Powder / Strips)".

B.I. Mehta — See under "Acids'".

Sesu Trading Corporation -- See under "Acids".

Thirumalai Chemicals Ltd. -- See under "Acids".

CROWN CAP PVC LINING MACHINE

Venus Packaging Services, 302 Palm Beach, Versova, Bombay 400 061 Tel: 6264835 Fact : 8113623/8113121/8113122

CROWN CAP PUNCHING PRESS

Venus Packaging Services -- See under "Crown Cap PVC Lining Machine".

CROWN CORKS

Standard Tin Works — See under "Caps & Closures"

CROWN CORKING MACHINES

Advance Packaging — See under "Bottle Closure Machinery".

Thihari-Ot Engg. Co., 16, Poppy Apartment, 3rd Floor, Ram Nagar, S. V. Road, Borivali (W), Bombay 400 092. Tel: 8054033.

CULTURE MEDIA

Hi-Media Laboratories Pvt. Ltd., 23, Vadwani Industrial Estate, L.B.S. Marg. Bombay 400086. Tel: 5150970/5151607 Fax: 00-91-022-5112468

DAIRY PLANT & EQUIPMENT

Alfa-Laval (India) Ltd., Bombay - Pune Road, Dapodi, Pune 411 012. Tel: 86321 (8 Lines) Tlx: 0146-219/259/326 ALL IN.

Chadha Sales Pvt. Ltd., 137, Rajindra Market, Tis Hazari, Delhi 110054. Tel : 2518477/2511416, Fax : 2914211

Continental Equipment India Pvt. Ltd. - See under "Bakery / Biscuit Equipment".

Dairy Farm Equipment (I) Ltd., Flat No. B2, Malati Co-op. Hsg. Society, Senapati Bapat Rd., Pune 411 016. Tel : 342456. Fax : 0212-342456.

Frigmaires Engineers — See under "Agitators"

Filtron Engineers Pvt. Ltd., C/o. Sparc, 117-A, Vithalwadi Rad Pune 411 030. Tel: (0212) 44068/444079. Fax: (0212) 447949 Tlx: 01 45-323 TRON IN

Kishor Trading Corp., Bussa Udyog Bhavan, Unit No. 203, Tokersey Jivraj Rd., Sewri, Bombay 400 015. Tel : 4131617.

M. N. Engineering Services, C/6 Vastu Sunder Society, Near Police Workshop, Aund, Pune 411007. Tel : 360378.

'METACOLOR', Shree Precoated Steel Ltd. -- See under "Refrigeration Equipment & Plant".

Saffaire India — See under "Air Conditioning/Refrigeration Plant & Equipment".

Unicorn Industries, 13/1 Rasulpura, Post Box 1687, Secunderabad 500 003.

United Technologie — See under "Conveyor".

DEHYDRATION MACHINERY

International Food Machinery, Krishna, Opp. Deep Bhavan, Pandit Nehru Marg, Jamnagar 361008. Tel : 72344 / 72567. Gram : EAGLEXPORT.

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ALOK CHEM CORPORATION

406, Goradia House, 100/104, Kazi Sayed Street, Bombay 400 003
Ph: Off:. 342 6390/5365 Res: 564 8355 Fax: No. 91-22-342 6390.

DEHUMIDIFIERS

Arctic India Sales 20, Rajpur Road, Delhi 110054. Tel: 2522424/ 231129. Tlx: 031-78003 AISL IN.

DEIONISERS

Soft-Dion Water -- See under "Demineralisers".

DEMINERALIZERS

Soft-Dion Water, 75, Laxmi Building, 4th Floor, Sir. P.M. Road, Fort, Bombay 400 001. Factory: Opp. Laxmi Talkies, Ambarnath Badlapur Road, Ambarnath 421 501. Tel: 2861599/2861946. Grams: SOFT-DION, Ambernath.

DESTONER, VACUUM TYPE

Goldin (India) Equipment Pvt. Ltd. -- See under "Cleaning / Grading Machinery".

DETECTION EQUIPMENT, Fire / Smoke, etc.

Subtronics, Kaliandas Udyog Bhavan, Unit No. 147, Near Prabhadevi P.O., Prabhadevi, Bombay 400 025. Tel: 4224461/ 4303047.

DIGITAL MOISTURE ANALYSER

Innovative Instruments, 125, Mahajan Society, Fatehganj, Vadodara 390 002. Tel: (0265) 21084

DISPENSERS, BEVERAGES

Frigmaires Engineers -- See under "Agitators"

Varun Ref-Air, 115, 3rd Flr., Nahar & Seth Indl. Estate, Bhandup, Bombay 400 078. Tel: 5649890/ 5641599.

DRYERS - BOTTLE / TRAY

The Royal Scientific Industries -- See under "Bottle Washing Machines".

DRYERS, OVEN/TRAY, ETC.

Agro Engineering Products (Delhi) P. Ltd., 30 South Extension Part-I, New Delhi-110049. Tel: 698928/617928, Tlx : 03-61287 AEECIN. Gram: AGROPRODUCT Fax : 011-617928.

Fabdecon Engineers -- See under "Agitators"

Kailash Scientific Co., 28 Universal Indl. Estate, I. B. Patel Rd., Goregaon (E), Bombay 400 063. Tel.: 8734735, 8731836.

SSP Pvt. Ltd. -- See under "Evaporators".

Sakav Enterprises -- See under "Air Driers"

E. VANILLIN

Balaji Dye Chem -- See under "Acids".

ELECTRONIC SCALES

Accurate Weighing Machines -- See under "Weighing Machines"

EMULSIFIER, FOOD

Kapadia Gum Industries, G. P. O. Box No. 1160, 3 Mint Road, 2nd Floor, Opp. G.P.O. Bombay 400 001. Tel: 261087/265073/267217. Grams: PHARMAGUM.

EMULSIFIERS

Cosywo Engineering Co. -- See under "Chemical Plant & Equipment".

Eskeyar Engg. Co.(P) Ltd., 10/ 5, Developed Plot, Ambattur Industrial Estate, Madras-600058. Tel: 654137/76046. Grams: Designesk, Fax : 91-44-76047.

Frigmaires Engineers -- See under "Agitators".

M. J. Shah & Co., 32, Hansraj Karamshi Building, 70 Masjid Bunder Road, Bombay 400003. Tel : 3752672/3491/0525 Tlx : C/o 73026. Gram : CAXCHEMIND. Fax : 91-22-3711845.

Mamko Process Equipment Manufacturers, Post Box No. 19001, Bombay 400 063. Tel : 8886309/8889913. Gram : MIXIN Bombay 400 063. Fax : (91 22) 8822757.

Remi Process Plant & Machinery Ltd., Cama Indl. Estate, Walbhat Lane, Goregaon (E), Bombay 400 063. Tel: 873 1998/ 4657. Tlx: 011-70118 RPML IN.

Sesu Trading Corporation -- See under "Acids".

United Technologie — See under "Conveyor".

ENGINEERS & DESIGNERS CONSULTING (See also under "Consultancy & Design")

Atul Consultants (P) Ltd., A-7, Pushpjali, New Delhi 110034. Tel: 7222985 / 7222590 / 7222572.

BASP Industries, G.P. Industries Compound, 96, Panch Pakhadi, P.O. Wagle Industrial Estae, Thane 400 604. Tel: 594775/505425.

Cosywo Engineering Company -- See under "Chemical Plant & Equipment"

Dalal Consultants & Engineers Pvt. Ltd., 44, Dr. R. G. Thadani Marg, Worli, Bombay 400 018. Tel : 4934821/22/4937669/ 4937570.

Forsberg Agritech (India) Pvt. Ltd. -- See under "Grain & Cereal Cleaning / Grading Machinery".

Frigmaires Engineers -- See under "Agitators".

M. F. Marketing Pvt. Ltd. -- See under "Autoclaves".

Mahendra Consultants P. Ltd., C-5, Chirag Enclave, New Delhi 110 048. Tel: 6416003 & 4. Grams : RELIANCE Telex: 66290 GTI IN Fax: 6467690.

ENZYMES

B. I Mehta -- See under "Acids".

Biocon India Private Ltd., 20th KM - Hosur Rd., Hebbagodi 561229, Bangalore Dist. Tel: 080-8422169 Tlx: 08408-211 BICN IN Fax: 080-8422623 / 5531662 Grams: BLASE Bangalore 34.

Olin Chemicals -- See under "Acetic Acid".

Rathi Papains Pvt. Ltd., 105/ 106, Dhanlaxmi Industrial Estate, Opp. Golden Dyes, Old Agra Road, Thane (W) 400 601. Tel: 534 4011/ 534 3445/534 6928. Fax: 91-22-2872811. Cable: PAPAINS.

EPOXY COATING

Manikant Brothers -- See under "Anti-Corrosion Chemicals".

EPS PACKAGING MATERIAL

K. K. Nag, T- 127 Bhosari Indl. Estate, Pune 411026. Tel : 790086/ 792370 Tlx : 0146-418 NAG IN

EPS PLASTIC CONTAINERS

Siltap Chemicals Ltd., E.P.S. Division, 17/18, Shah Industrial Estate, Veera Desai Rd., Andheri (W), Bombay 400 058 Tel: 8267260/61/63/64/65

ESSENCES & FLAVOURS

Aroma Industries, 128/14C, Kidwainagar, Kanpur 208011, U.P.

Bush Boake Allen (India) Ltd., 1-5, Seven Wells Street, St. Thomas Mount, Madras 600 016, Tel: 431131 Grams: ABRACOL-MADRAS Tlx: 041 26058 BBA IN.

Feroze Foods & Flavours, 403, Central Tin Est., F. Kondeo Marg, Sussex Road, Byculla, Bombay 400 027. Tel: 3729724 / 3614972.

Gogia Chemical Industries -- See under "Essential Oils".

Harish C. Khosla & Co., Zinat Mahal, Lalkuan, P.O. Box 1328, Delhi 110 006. Tel: 7524803/ 733160 Gr: THYMOL Tlx: 62267 HCK IN

Jupiter & Co., Shop No.1, Sushma Soc. Near Hindu Milan Mandir, Annie Besant Rd., Surat 395 001.

M. C. Davar Aromatics Pvt. Ltd., 266, B. J. Dadaji Marg, Hormazd Mansion III Floor, Opp Bhatia Hospital, Tardeo, Bombay 400 007. Tel: 359468 Tlx: (11) 85892 DAVR IN.

Sesu Trading Corporation -- See under "Acids".

Sonarome Chemicals Pvt. Ltd. -- See under "Aromatic Chemicals".

Spac Aromas, P. B. No. 6874, Bombay 400 057. Tel: (O) 319724/ 317571. Fact: 634 5574/6340543. Grams: AROMASPAC, Bombay 2

Ultra International Pvt. Ltd., 304, AVG Bhawan, M-3, Conaught Circus, New Delhi 110 001. Tel: 91-11-3324100/3324200 Tlx: 31-61558 SANG IN.

Universal Flavours & Fragrances, 133, New Apollo Estate, Mogra Village Road, Andheri (E), Bombay 400 069. Tel : 8322631/ 8200106. Gr : JEPYPATEL, Bombay 49.

Vin Flavours -- See under "Additives, Food & Beverage"

ESSENTIAL OILS

Bhagat Impex P. Ltd., 164, Sitaram Poddar Marg, Bombay 400002. Tel : 2060785, 2086587/ 6852. Tlx : 011-85356 BFCL IN. Fax : 022-2060638.

Calcutta Essence Supply Co., 41, Ezra St., Calcutta 700 001, W.B. Tel: 266861 Grams: SUGANDHI.

Garden Chemical Works, Shiv-Kripa Industrial Estate, Unit No. 113, 1st Fl., L. B. Marg, Vikhroli, Bombay 400 083 Tel : 5782117.

Gogia Chemicals Industries, A-127, Okhla Industrial Area, Phase II, New Delhi 110 020. Tel: 6836007/6303329. Gr: ORANGE OIL. Fax : (91) (11) 6840763

Gupta & Company Ltd., XIV/ 294, Gali Mandi Pan, Sadar Bazar, Delhi 110006. Tel: 7774742 / 528923 / 527795 Tlx: 31-66075

GCPL-IN. Fax: 011-7519215 Cables: AROMA DELHI 110006.

Harish C. Khosla & Co. -- See under "Essences & Flavours".

Kulu Aromatics, Shamshi 175126, Kulu, H. P. Tel: (01902)-5179, Fax: (01902) - 2720 Grams: AROMATICS.

L. B. Aroma & Chemicals, 4 Omex Chambers, Gr. flr., Rajeshwari Shahu Marg, (Telli Galli Road), Andheri (E), Bombay 400 069. Tel: 6121 258/613 3066. Gram: OIL TRADES, Bombay 57. Fax: 91-22-6111646. Tlx: 011-78159 FCS IN.

Manak Citrus Products P. Ltd., At & Post: Utran, Dist. Jalgaon 425 001, Pachora -70.

Olin Chemicals -- See under "Acetic Acid".

Sesu Trading Corporation -- See under "Acids".

Srilarome, FF-7 Greenery, 16 Plain Street, Bangalore 560 001. Tel: 5592751 Fax: 91-80-5592751

EVAPORATORS

SSP Pvt. Ltd., 19 DLF Indl. Area II, 13/4 Mathura Rd., Faridabad 121003 Tel: 82-75441/ 8277730/8275968, Gram : ESESPEE. Tlx : 034-286 SSP IN

United Technologie -- See under "Conveyor".

EXTRUDED POLYMER MESH

Netlon India, 2 Gokul Society, Sindhawai Mata Rd., Vadodara 390004. Tel : (0265) - 553598/ 559101 Tlx : 0175-6116 NET IN

EXTRUDERS

Dr. TK Food Consultants & Exporters -- See under "Consultancy & Design".

Do-Well Oil Plants Pvt. Ltd., 306 Manish Commercial Centre, Dr. Annie Besant Rd., Worli, Bombay 400 025. Tel : 4937219/ 4934056 Tlx: 11-75573 DWL IN. Grams : DOTRACT.

Fabdecon Engineers -- See under "Agitators"

Trumatic Engineers. 91/18 GIDC Estate, Vatwa, 1st Phase, Ahmedabad 382445. Tel : (0272) 830353. Tlx : 1216611. Fax : (0272) 833148.

FABRICATED EQUIPMENT

Cosywo Engineering Company -- See under "Chemical Plant & Equipment".

Fabdecon Engineers -- See under "Agitators"

Frigmaires Engineers -- See under "Agitators".

Mazda Hospital And Industrial Equipment Pvt. Ltd., 6, Datta Mandir Road, Bhandup, Bombay 400 078. Tel: 5601861/5614920

United Technologie -- See under "Conveyor".

FASTFOOD EQUIPMENT

Continental Equipment India Pvt. Ltd. -- See under "Bakery/ Biscuit Equipment"

L. L. Equipment & Machines Pvt. Ltd., 35-36/C, L. K. Arcade, Marol Naka, Sir M. V. Rd., Andheri (E), Bombay 400 059. Tel: 8344182/8360843

United Technologie -- See under "Conveyor".

FIBRE GLASS ADHESIVE TAPE

Unnati Corporation, 423-425 GIDC Tele. Exch. Lane, Odhav, Ahmedabad, 382415, Tel. : 873434/872277, Tlx.: 121-6816, ANAR IN Fax : 272-366505.

FILLING & SEALING MACHINES

Accurate Weighing Machines Co., -- See under "Weighing Scales".

Acmevac Sales Pvt. Ltd. -- See under "Bottle Washers & Rinsers".

Automatic Devices -- See under "Augur Fillers".

Crystal Engineering Co. India, WZ-2C/1, Basai Darapur, New Shiv Mandir, New Delhi 110015. Tel : 591628 (R) 2282846.

Ece Cee & Co., 1, Anant Indl. Est, Opp. Comet Fruit & Chemicals, Rakhial, Ahmedabad 380023. (Gujarat) Tel: (O) 368311 (R) 400 860 Grams: EXTRAHEAT.

Fabdecon Engineers -- See under "Agitators".

Frigmaires Engineers -- See under "Agitators".

Gansons Engineers Pvt. Ltd. -- See under "Form-Fill-Seal Machines".

Mamko Process Equipment Manufacturers -- See under "Emulsifiers".

Mittal Engineering Works, Plot No. C-30, Road 16, Wagle Industrial Estate, Thane 400 604.

Samarpan Fabricators Limited, Plot A-182/A-183, Road 16/Z, Wagle Industrial Estate, Thane 400 604. Tel: 5321842/5320373/ 5320822/5320029/5320730 Grams : PROPAC Tlx : 011-72329 SEL IN Fax : 91-22-5320033

Unique Flexo Packaging, Gala No. B/270, Joshi Wadi, Off Manpada Road, Dombivli (E), Bombay 421 201.

United Technologie -- See under "Conveyors".

FILM MULTILAYER

Eco Plast Pvt. Ltd., Sona Udyog Bldg. No.4, 2nd floor, Parsi Panchayat Road, Andheri (E), Bombay 400063. Tel: 8325364/8325837 Tlx: 11-79171 VKEP IN Fax : 8366384

Propack Industries, Sona Udygo, Bldg. No. 4, 2nd Floor, Parsi Panchayat Rd., Andheri (E), Bombay 400 069. Tel: 8325364 / 8325837. Fax: 6366384.

FILM WRAPPERS

Ankit Packaging Pvt. Ltd., H. O. 3-6-140 Liberty Rd., Himayatnagar, Hyderabad 500029. Tel : 236645 Grams : CENTPACK

Amol Dicalite Limited, S/4 Navrang Swastik Cross Rd., Navrangpura, Ahmedabad 380009. Tel : (0272) 400408/400458 Fax : (0272) 429103

FILTERS

Britomatics -- See under "Filtration Systems".

Khanna Bolting Enterprises, 121, 1st Floor, Veena Beena Shopping Centre, Near Bandra Station, Bombay 400 050. Tel: 6424565/ 6409535/6422308.

Otoklin, Plot No. 1, Shah. Indl. Area, V. Desai Rd., Andheri (W), Bombay 400 058. Tel : 6267476.

Shriyan & Co., 33 Sunil Shopping Centre, Opp. Navrang Cinema, J. P. Rd., Andheri (W), Bombay 400 058. Tel: 828 6318. Fact: 826 9104/826 9057.

Soft-Dion Water -- See under "Demineralizers".

Ultrafilter (I) Pvt. Ltd., Plot No. 70, Bommasandra Indl. Area, Anekal Taluk, Bangalore 562158 Tel: (0812) 220159 / 422491 Tlx: (08408) 22 UIPL IN Fax: (0812) 422470.

Watrion Water and Filter Engg. Pvt. Ltd. -- See under Boilers"

FILTER PRESSES

Fluid Control Equipments, 77/ 574, Mount Rd., Madras 600 006. Tel: 451159. Gr.: FLUID-CON.

Purity Textile Pvt. Ltd., 12

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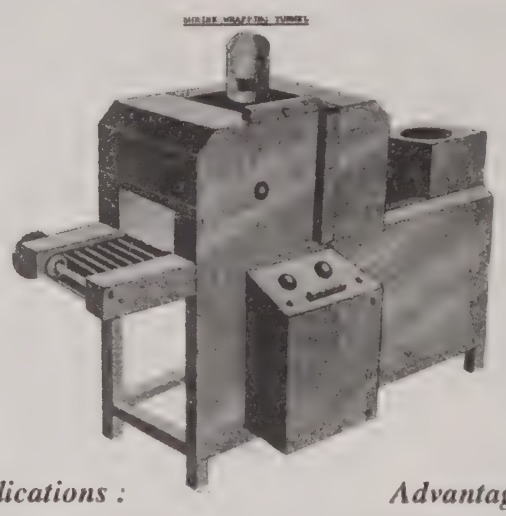

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Off : 1, Hormuz, 131, August Kranti Marg, Bombay 400 036. Phone : 3670537 I 3675277

Krystal Blue, 11th Lane, Near BSES, Santacruz (E), Bombay 400 055. Tel: 6116314/6116137. Tlx: 1178117 - PTPLIN. Grams : KHOFIL. Fax: 6131348

FILTER PAPER

Lab Instruments -- See under "Heating Mantles"

FILTRATION SYSTEMS

Britomatics, C-9, Nanddham Indl. Estate, Marol Maroshi Rd., Bombay 400 059.

Ion Exchange (India) Limited Ticcicon House, Dr. E. Moses Rd., Mahalaxmi, Bombay 400001. Tel.: 4939520/23/25/31/32 Tlx. : 011-73787 IONX IN. Fax : (91) 22-4942756.

Parksan Filters Pvt. Ltd., G-4 Mahavir Mansion, Plot No. 16, Garodia Nagar, Ghatkopar (East) Bombay 400 077. Tel : 5130668

Pharma Concept, G-4 Mahavir Mansion, Plot No. 16, Garodia Nagar, Ghatkopar (East) Bombay 400 077. Tel : 5130668/5111222, Tlx : 011-71515, Fax : 5115904

FLAVOURS, FOOD

Duckworth Flavours (India) Pvt. Ltd., Khoday House, 26/2 Sankey Road Cross, Bangalore 560052. Tel : 268116/268118 Tlx : 0845-2783 KODE IN

Jupiter & Co., Susma Society, Shop No. 1, Near Annie Besant Hall, Surat 395001.

M. S. Speciality Flavour & Fragrances Pvt. Ltd., Hormazd Mansion, 3rd Floor, 266B J. Dadaji Marg, Tardeo, Bombay 400007. Tel : 3879468 / 3865189. Tlx : 11-73757 DAVR IN. Fax : 3871214.

Sonarome Chemicals Pvt. Ltd. -- See under "Essential Oils".

The Chemical Engg. Corp. Pvt. Ltd. Ponpadi RS & P. O. Pin 631213. Chengai MGR Dist., TN.

FLAVOURING COMPOUNDS

Gajraj Agencies, 19, Bharathiyar, 4th St., S. S. Colony, Madurai 625016. Tel: 34568. Grams "GAJESSENCE" Madurai 625 016.

FLAVOURING EMULSIONS

M. C. Davar Aromatics Pvt. Ltd. -- See under "Essences & Flavours".

FLOUR MILLS

Bemco Agro Implement Pvt. Ltd., P. O. Udymabag, Belgaum 5900 008. Tel : 30388. Gram : BEMCO AGRO. Tlx: 0863-287.

FLOW METERS

Aqua Engineering, 6 Haji Habib Bldg., 1st Fl., Dr. Ambedkar Rd., Dadar, Bombay 400 014. Tel : 4110324 Grams : FLOWME.

FLUID BED DRYERS

Flora Engineering Co., A-4/A-42 Laghu Udyog Kendra, I. B. Patel Rd., Goregaon (E), Bombay 400 063. Tel: 873-5768 Fax: 91-22 2873059.

FLUID EXTRACTION PLANTS

Pushkaraj Enterprises, 1414, 1B Sadashiv Peth, Pune 411030, Tel : 0212-446222 Fax : 0212-446222.

FLY KILLERS, ELECTRIC

Opel Industries 235-A, Adyaru Industrial Estate, Sun Mill Compound, Lower Parel, Bombay 400 013. Tel; 4924123/4926884.

FOOD COLOURS (See also "Colours, Food & Beverage")

Asim Products, 296, Samuel Street, Room No. 29, 2nd Floor, Bombay 400 003. Tel: 321125/ 337731 (O): (R) 8229233/ 8128001. Tlx: 11-73145 ASIM IN.

Bush Boake Allen (India) Ltd., -- See under "Essences & Flavours".

Vino Synth Chem Pvt. Ltd., 404 Bezzola Commercial Centre, Sion Trombay Road, Chembur Bombay 400 071. Tel : 5522539/5528958 Cable : VINOBIN. Fax : 5522539.

FOOD FRIERS

Ross Enterprises -- See under "Boilers".

FOOD PROCESSING EQUIPMENT/ PLANTS

Alfa Laval (India) Ltd., Dapodi, Bombay Pune Rd., Pune 411012. Tel: 776 321 / 311 960. Fax: 011-352263.

Atul Consultants (P) Ltd., A-7, Pushpanjali Enclave, Outer Ring Road, Pitampura, New Delhi 110034. Tel : 7274590. Tlx : 63085 JNBR Attn : Paliwal, Grams : ATUCONSULT. Fax : (011) 7274572.

Avo Industries, 14/9 Vithal Nagar, Solapur Road, Hadapsar, Pune 411 028. Tel : 670932.

Cantech Machines -- See under "Can Closing & Seaming Machine".

Continental Equipment India Pvt. Ltd. -- See under "Bakery/Biscuit Equipment".

Fabdecon Engineers -- See under "Agitators".

Geeta Food Engineering, Ashirwad Complex, Vashi Village, Opp. Starling Hospital, Gala No. 2, New Bombay 400 703. Tel : 022-7667069.

HMA Consultants Pvt. Ltd., 859, Sector 15 A, Faridabad 121 002. Tel : 8282040. Fax : 8282040.

Hi-Tech Systems, 80, Hardwar Road, Dehradun 248005. Delhi Office : C-9B, Gangotri Enclave, Alakhnanda, Kalkaji, New Delhi 110 019. H.O. 25853 D.O. : 6436772. Gr: ATMA

IBP Co. Ltd., A-4 MIDC Area, Ambad, Nasik 422010 Tel : 29333/ 29334 Tlx : 0752259 Fax : 0253-22362

New Indo International, 135, A, Begampur, Malviya Nagar, New Delhi 110017. Tel : 6445315/ 6453289

Metal Plants -- See under "Contra-Rotary Mixers".

'METACOLOR', Shree Precoated Steel Ltd. -- See under "Refrigeration Equipment & Plant".

FORM-FILL-SEAL MACHINES

Eee Cee & Co., -- See under "Filling & Sealing Machines".

Gansons Engineers Pvt. Ltd., 118/121 Swastik Chambers, Off. Sion-Trombay Rd., Chembur, Bombay 400 071. Tel : 524548/ 524967.

Indian Packaging MAchineries, 1-15, D. L. F. Industrial Area, Phase 1, Faridabad 121 003. Tel : 8-276112. Fax : 0118-212596.

Padmatex Engineering Ltd., 8th Fl., Mafatlal Centre, Nariman Point, Bombay 400 021. Tel: 2025452/243566 Tlx: 011-82730 PEL/011-86796 PEL IN.

Pakona Engineers (India) Ltd., -- See under "Machinery, Packaging".

R.M.C. Packaging Systems (P) Ltd., 25 A & B, Electronic Complex, Kushalguda, Hyderabad 500762. Tel : 622556/853913/ 824308. Tlx : 0425-7099 PCO-IN

Unique Flexo-Packaging, Gala No. B-270, Off Manpada Road, Opp. Kasturi Plaza, Joshiwada, Dombivli (E) 421 201. Tel: 5785723.

FREEZE DRYING PLANTS

IBP Co. Ltd., -- See under "Food Processing Machinery & Plant".

FREEZERS

Dairy Den (India) Pvt. Ltd., -- See under "Ice-cream Equipment".

FUMARIC ACID

Amit Fine Chem. -- See under "Agar Agar (Powder/Strips)".

Ganesh Dehydride Ltd. -- See under "Additives, Food & Beverage".

Olin Chemicals -- See under "Acetic Acids"

GAS ANALYSERS FOR NITROGEN CYLINDERS

Technovation -- See under "Analysers".

GAS MONITORING EQUIPMENT

Technovation -- See under "Analysers"

GELATINE

Amit Fine Chem. -- See under "Agar Agar (Powder / Strips)".

GHEE FILTRATION UNITS

Codex Enterprises -- See under "Batch Coder".

GLASS & GLASSWARES

Haldyn Glass Limited, Off Western Express Highway, Goregaon (East), Bombay 400 063. Tel : 3730311/4 lines Fax : (022) 8735231) Tlx : 011-70047 HGWL IN

R. G. Glass Agency -- See under "Bottles & Jars, Glass".

GLASS FABRICS, PTFE COATED

Unnati Corporation -- See under "Adhesive Tapes, PTFE, Glass".

GLYCON

Balaji Dye Chem -- See under "Acids".

GRAINS & CEREALS CLEANING / GRADING MACHINERY

Forsberg Agritech (India) Pvt. Ltd. 315, Race Course Towers, Race Course Circle, Baroda - 390 015. Tel: 320597 Fax: 322150.

GRAPE GUARD

Arun & Co., 69, Kitab Mahal, 192, Dr. D. N. Rd., Bombay

00 001. Tel : 2044026/6552/6649 Tlx:011-85545.

GRAVITY SEPARATOR

Goldin (India) Equipment Pvt. Ltd. -- See under "Cleaning / Grading Machinery"

GRINDER, WET & DRY

Sesa Pulverisers, Kala Kila Road, Dharavi, Bombay 400 017. Tel:4121434.

GRINDING MILLS

Frigmaires Engineers -- See under "Agitators".

Kaps Engineers, 831, GIDC Indl. Estate, Makarpura, Vadodara 390 010. (Gujarat). Tel: 43178. Grams: KAPS. Tlx: 0175-533 MICON IN. Fax: 0265-43679.

Sesa Pulverisers -- See under "Grinder, Wet & Dry".

V. Ranganathan Engineering Works, Plot No. 163, CST Road, Behind Mariya Mansion, Kalina, Santacruz (E), Bombay 400 098. Tel: 8151880.

GUAR GUM

Ace International, 13/21, Laura Bldg., 1st Floor, 1st Dhobi Talao Lane, Bombay - 400 002. Tel: (O) 051413 / 2058169 Fax: 2089282 Tlx: 011-86654 PCOK IN.

Alok Chem Corporation,406, Goradia House, P.O. Box No. 3048, 100/104, Kazi Syed Street, Bombay 400 003. Tel: 3426390/ 365. Res: 5648355. Fax: 91-22-426390.

Altrafine Gums, 91/17, GIDC Estate, 1st Phase, Vatwa, Ahmedabad 382445. Tel : (0272) 30469. Tlx : 1216611. Fax : (272) 833148.

Amba Gums & Feeds Products, 88/3, GIDC Estate, Vatwa, Ahmedabad 382445. Tel : (0272) 830624. Tlx : 1216611. Fax : (0272) 833148.

Indian Gum Industries Ltd.,51-A, Maker Chambers IV, Nariman Point, Bombay 400 021. Tel: 91-22-2852075-76. Fax: 91-22-2040393. Tlx : 011-821391 IGUM. Gram : INORGANA, Bombay

Kapadia Gumchem Industries, 3, Mint Road, 2nd Floor, Room No. 30, Opp. G.P.O. Box No. 1160, Bombay 400 001 Tel: 2615073/ 2617217 Gram: PHARMAGUM. Fax: 91-22-2619423 Tlx : 011-86630 KGI IN

Swastik Gum Industries (India) 328 G. V. M. M., Vasahat, Odhav, Ahmedabad 382415. Tel: 870063 / 870064 / 870065 Tlx: 011-73265 KATR IN (Bombay).

GUAR GUM POWDER

Ace International -- See under "Guar Gum".

Kapadia Gumchem Industries, -- See under "Guar Gum".

Ultrafine Gums, 91/17, GIDC Estate, 1st Phase, Vatwa, Ahmedabad 382445. Tel.: 830469/ 830353.

GUM ACCACIA

Ace International -- See under "Guar Gum".

Alok Chem Corpn. -- See under "Guar Gum".

Indian Gum Industries Ltd. -- See under "Guar Gum".

Kapadia Gumchem Industries, -- See under "Guar Gum".

GUM ALGEL

Alok Chem Corp -- See under "Guar Gum"

GUM ARABIC

Ace International -- See under "Guar Gum".

Alok Chem Corp. -- See under "Guar Gum".

Balaji Dye Chem -- See under "Acids".

Indian Gum Industries Ltd. -- See under "Guar Gum".

Kapadia Gumchem Industries, -- See under "Guar Gum".

GUM KARAYA

Alok Chem Corporation -- See under "Guar Gum"

GUMS, FOOD

Alok Chem Corp. -- See under "Guar Gum".

Burzin and Leons Agenturen Pvt. Ltd -- See under "Additives, Food & Beverage"

Indian Gum Industries Ltd. -- See under "Guar Gum".

Kapadia Gumchem Industries -- See under "Guar Gum".

Olin Chemicals -- See under "Acetic Acid"

GUM TRAGACANTH

Ace International -- See under "Guar Gum".

Alok Chem Corporation -- See under "Guar Gum".

HM - HDPE CONTAINERS

Ratnajeet Polycon Ltd., -- See under "Barrels".

HEADSPACE GAS ANALYSERS

Technovation -- See under "Analysers".

HEATING ELEMENTS

Subash Gupta & Co., 100 Arya Nagar, Ghaziabad 201009. Tel: 871471/8723893/2293795 (Delhi)

HEAT EXCHANGERS

Alfa Laval (India), Dapodi, Pune 411 012. Tel: 776321 (8 lines)

Arctic India Sales -- See under "Dehumidifiers".

Precision Tanks & Vessels (P) Ltd., 3-4, Block B, LSC Naraina Ind. Area, Phase II, New Delhi 110 028 Tel: 5705476 / 5708201.

HEATING MANTLES

Lab Instruments, Ratnadeep, 1st Floor, 78, B. Jagannath Shankar Seth Rd., Behind Panchratna, Near Roxy, Opera House, Bombay 400 004. Tel: 3610973. Fax : 3634619.

Manikant Bros. -- See under "Anti-Corrosion Chemicals".

Subhash Gupta & Co.,-- See under " Heating Elements"

HOMOGENIZERS

Cosywo Enginering Co. -- See under "Chemical Plant & Equipment".

Frigmaires Engineers -- See under "Agitators".

Goma Engineering Pvt. Ltd. B/9, Kayteeco Industrial Estate, Majiwada, Thane 400 601. Tel : 5340875/5346436/5341937. Tlx : 011-72389 TCWE IN Fax : 91-22-5342682

J. T. Jagtiani -- See under "Machinery, Food & Beverage Processing".

Mamko Process Equipment Manufacturers -- See under "Emul-

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sifiers".

United Technologie -- See under "Conveyors".

HUMIDIFIERS

Arctic India Sales -- See under "Dehumidifiers".

ICECREAM EQUIPMENT

Capital Equipment Co., C-174, Naraina Ind. Area, Phase 1, New Delhi.

Dairy Den (India) Pvt. Ltd., 25, Madhuvan, Ellisbridge, Ahmedabad 380 006. (Representing: Carpigiani S.r.l. (Italy) Tel: 461205/402046 Tlx: 121-7157 DDPL IN. Fax: 91-272-443537.

R & D Engineers -- See under "Ice Cream Cone Machines".

Spectrum Machinery Mfrs. Pvt. Ltd., 1510 Maker Chamber V, Nariman Point, Bombay 400021. Tel:230344 / 223549/2047340 Fax : 0091-22-2047340

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R & D Engineers, A-41/1, I.D.A. Kukatpally, Phase II, Road No.4, Hyderabad 500 037 Tel : 040-279121. Fax : (842) 841697

ICE CREAM FILLERS

The Panchal Workshop, P.B. No. 62, Anand Sojitra Rd., Anand 388001. Tel: (02692)23332 Gr: VARSHA.

INDUSTRIAL GAS MONITORS

Subtronics, Kaliandas Udyog Bhavan, Unit No. 147, Near Prabhadevi H.P.O. Bombay 400 025. Tel : 4224461/4303047

INDUSTRIAL HEATERS

Subash Gupta & Co. -- See under "Heating Elements".

INSECT KILLERS (INSECTOCUTORS, ELECTRIC)

Gajjar Sales & Service Centre, 11, New BMC Shopping Centre, Senapati Bapat Marg, Bombay 400 025. Tel: 4227017. Res: 4371379.

Opel Industries -- See under "Fly Killers, Electric".

INSTRUMENTS, INDUSTRIAL AND PROCESS CONTROL

Lab-Instruments -- See under "Heating Mantles".

JERRY CANS

Ratanajeet Polycon Ltd., -- See under "Barrels".

JUICE DISPENSERS

Varun Ref-Air -- See under "Dispensers, Beverages".

JUICE EXTRACTOR

Geeta Food Engineering -- See under "Food Processing Equipment /Plants".

KETTLES (STEAM JACKETTED)

Continental Equipment India Pvt. Ltd. -- See under "Bakery/ Biscuit Equipment".

Geeta Food Engineering -- See under "Food Processing Equipment /Plants".

KHOA MAKING MACHINES

Varsha Machinery Corporation, C-6, Shivaji Stadium, Mangalwar Peth, Kolhapur 416012. Tel: 20674 Gram : VARSHA CORP.

KITCHEN EQUIPMENT

Advance Equipments Co. -- See under "Air Conditioning & Refrig. Plant/Equip."

Continental Equipment India Pvt. Ltd. -- See under "Bakery/ Biscuit Making Equipment"

Dairy Den (India) Pvt. Ltd., (Representing Zanussi Grandi Impianti (Italy) -- See under "Ice cream Equipment".

Frigmaires Engineers -- See under "Agitators".

KNEADERS

Fabdecon Engineers -- See under "Agitators".

Frigmaires Engineers -- See under "Agitators".

LABEL GUMMING MACHINE

Jacsons Sales India, 8-4, Morar Flats, Maninagar (East), Ahmedabad 380 008. Tel: 830156/ 833408 Grams: JAL-DEEP.

LABELLING MACHINES

Interlabels, 15, Ravi Indl. Estate, Off Mahakali Caves Rd., Andheri (E), Bombay 400 093. Tel: 8346442.

Jacsons Sales India -- See under "Label Gumming Machine".

J. T. Jagtiani -- See under "Machinery, Food & Beverage Processing".

Maharshi Udyog, 4 , Ruchi, 36,Swastik Society, Navrangpura, Ahmedabad 380009. Tel: 409183 Tlx: 0121-6369 GOPI IN. Fax : 0272 - 425456

Lab Instruments -- See under "Heating Mantles".

LABEL PRINTING MACHINE

Codex Enterprises -- See under "Batch Coder".

Jacsons Engineers, Phase 4, Plot No. 4701, G.I.D.C. Ind. Estate, Vatva, Ahmedabad 382 445. Tel: 830155 Gram : JALDEEP

LABORATORY EQUIPMENT

Lab Instruments -- See under "Heating Mantles".

United Technologie -- See under "Conveyor".

LACTIC ACID

Balaji Dye Chem -- See under "Acids".

Parul Enterprises -- See under "Agar-Agar (Powder / Strips)"

Sesu Trading Corp -- See under "Acids".

LAMINATED POUCHES

Shreeji Polylaminates Pvt. Ltd., 7 Ajanta Estate, B/h Gujarat Bottling, Rakhial, Ahmedabad 380023. Tel : 369121

LEMON OIL

Olin Chemicals -- See under "Acetic Acid".

LIME OIL

Olin Chemicals -- See under "Acetic Acid".

Southern Citrus Products (P) Ltd. -- See under "Pectin".

LIQUID FILLING MACHIN

Dynatech Marketing Company, 303/F2, Poonam Kunj, Poonam Nagar, Andheri (E), Bombay 400 093. Tl.: 8377749 Fax: 836 4254

LIQUID GLUCOSE

Olin Chemicals -- See under "Acetic Acid".

MSG (AJINOMOTO)

Parul Enterprise -- See under "Agar-Agar (Powder/Strips)"

Sesu Trading Corp. -- See under "Acids".

MACHINERY, CONFECTIONERY

Continental Equipment India Pvt. Ltd. -- See under "Bakery/ Biscuit Equpment"

Fabdecon Engineers -- See under "Agitators".

Frigmaires Engineers -- See under "Agitators".

Mangal Engineering Works -- See under "Biscuit Making Machines".

United Technologie -- See under "Conveyor".

MACHINERY, DAIRY PROCESSING

Fabdecon Engineers -- See under "Agitators".

Filtron Engineers P. Ltd., SPARC, 117-A, Vithalwadi Road, Pune 411 030. Tel: 0212/440068

Frigmaires Engineers -- See under "Agitators".

United Technologie -- See under "Conveyor".

MACHINERY, FOOD & BEVERAGE PROCESSING

Dedhia Engg. Corporation, 129, Shanti Indl. Estate, Sarojini Naidu Rd., Mulund (W), Bombay 400 080.

Fabdecon Engineers -- See under "Agitators".

Fillopack Industries -- See under "Bottle Fillers".

J. T. Jagtiani, National House, Tulloch Road, Apollo Bunder, Bombay 400 039. Tel: 2020028/ 2021433.

Perfect Magnets (P) Ltd -- See under "Magnetic Separators"

Ross Enterprises -- See under "Boilers".

Saffaire India -- See under "Air Conditioning/Refrigeration Plants & Equipment".

Shriyan Enterprises, 33, Sunil Shopping Centre, J. P. Road, Andheri (W), Bombay 400 058. Tel: 826318/820062.

Sifter India Food Processing Machines Pvt. Ltd., Plot No. 227, Sector 24, Faridabad 121 005, Haryana. Tel: 8242586 / 8242597. Grams : SIFTER.

United Technologie -- See under "Conveyor".

Westfalia Separator India Pvt. Ltd., 201, Kirti Deep, 2 Nangal Raya Business Centre, New Delhi 110 046. Tel: 011-5500538/ 5500562 Fax: 011-5598013

MACHINERY, PACKAGING

Aarkey Industries, 1, Hormuzd, 131, August Kranti Marg, Bombay 400 036. Tel: 367-0537, 367-5277 Gram: CRAFTWORLD.

Bhagwati Supervac Pvt. Ltd. "Bhumika" Sheth C. G. Rd., Next

to Associated Petrol Pump, Ellisbridge, Ahmedabad 380 006 Tel: (0272) 445682 Tlx: 0121-6630 BHAVIN.

Frigmaires Engineers -- See under "Agitators".

Ganga Singh Sukhwinder Singh & Sons -- See under "Canning Machinery & Plants".

H. R. Paper Machinery Pvt. Ltd. -- See under "Pouch Filling Machine".

Indec Equipment Pvt. Ltd. -- See under "Aseptic Packaging"

Jacsons Sales India -- See under "Label Gumming Machines".

Kaps Engineers -- See under "Grinding Mills".

Monga Packaging Pvt. Ltd., Box No. 17622, Mamlatdar Wadi Road, Malad (W), Bombay 400 064. Tel: 8821334/8821662.

Novel Termoplast Pvt. Ltd., 316 Tulsiani Chambers, Nariman Point, Bombay 400 021.

Package India, W-115 A, III Avenue Anna Nagar, Madras 600040.

Pakona Engineers (India) Pvt. Ltd., 22-D, Wadia Charities Bldg., 2nd Floor, S. A. Brelvi Street, Fort, Bombay 400 023. Tel: 2872181/ 2874642.

Production Engg. Consultants -- See under "Pillow Pack Machines".

R. G. K. Enterprises, Madhu Kunj, Vinod Baug, Juhu-Line, Block No. 12, Ground Floor, Andheri (W), Bombay 400 058.

Recon Machine Tools Pvt. Ltd. -- See under "Can Closing & Seaming Machines".

Rollatainers Limited, 13/6, Matunga Road, Faridabad, Haryana. Tel : 8275342/72/19. Tlx : 031-63209. Grams : ROLAPAK, FARIDABAD. Fax : 8275392/ 6424550.

Samarpan Fabricators Limited -- See under "Filling & Sealing Machines".

Subash Gupta & Co. -- See under "Heating Elements"

Ultra Enterprises, CB-229, Ring Road, Naraina, New Delhi 110028. Tel: 5435556 / 5437795 / 5442289 / 5457508.

Unique Flexo Packaging -- See under "Automatic Form-Fill-Seal Machines".

MACHINERY, PHARMACEUTICAL/ CHEMICAL

Advance Equipment Co. -- See under "Air Conditioning/Refrigeration Plant & Equip."

Fabdecon Engineers -- See under "Agitators".

Fillopack Industries -- See under "Bottle Fillers".

J. T. Jagtiani -- See under "Machinery, Food & Beverage Processing".

MACHINERY, WRAPPING

R. G. K. Enterprises -- See under "Machinery, Packaging ".

MAGNETIC SEPARATORS

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MALIC ACID

Olin Chemicals -- See under "Acetic Acid"

MALT EXTRACT

Amit Fine Chem -- See under "Agar Agar (Powder/Strips)"

Balaji Dye Chem -- See under "Acids".

Metro Essence Mart, 119/37-A Nasimabad, Gumti No. 5, Kanpur 12. Tel: 217589 / 297282 / 246757.

Olin Chemicals -- See under "Acetic Acid".

MALTODEXTRINE

Olin Chemicals -- See under "Acetic Acid"

MATERIAL HANDLING SYSTEMS

Advance Dynamics, Plant 1, B-110, Mayapuri Industrial Area, Phase 1, New Delhi 110 064.

Ferro Foundries Private Ltd. -- See under "Conveyor, Roller".

Frigmaires Engineers -- See under "Agitators".

Goldia (India) Equipment Pvt. Ltd. -- See under "Cleaning / Grading & Machinery".

Indo - Berg Limited, 509 Mansorovar 90, Nehru Place, New Delhi 110019. Tel : 6431908/ 6438365 Tlx : 031-62332/031-70241 Fax: 11-6464994

Mac Industiral Systems, C/80, Snehdhara Society, Dadabhai X Road No. 3, Vile Parle (W), Bombay 400 056. Tel : 8324244.

Maharshi Udyog -- See under "Labelling Machines".

United Technologie -- See under "Conveyor".

MEAT FLAVOUR

Tajir Private Ltd. -- See under "Caramel Food Colour".

METERING PUMPS

Jagdish Engg. Works -- See under "Pumps"

MIXERS, INDUSTRIAL

Cosywo Engineering Company -- See under "Chemical Plant & Equipment".

Fabdecon Engineers -- See under "Agitators".

Frigmaires Engineers -- See under "Agitators".

Metal Plants -- See under "Contra-Rotary Mixers".

Remi Engineering Industries Ltd., 11, Cama Industrial Estate, Walbhat Lane, Goregaon (E), Bombay 400 063 Tel: 8731998/8732729 Tlx: 011-70118 Fax: 234216.

United Technologie -- See under "Conveyor".

MIXERS, POWDER & PASTE

Cosywo Engineering Co. -- See under "Chemical Plant & Equipment".

Fabdecon Engineers -- See under "Agitators".

Frigmaires Engineers -- See under "Agitators".

Metal Plants, -- See under "Contra-Rotary Mixers".

United Technologie -- See under "Conveyor".

MOISTURE ANALYSER BALANCES

Anamed Instruments Pvt. Ltd., 1st Fl., Sita Estate 'A', Plot CTS-133/135 Mahul Rd., Chembur, Bombay 400 074.

MOLASSES MIXER

Trumatic Engineers, 81/18, GIDC Estate, Vatwa, Nr. Bank of India, 1st Phase, Ahmedabad 382 445. Tel: 00-91-272-830-353. Fax: 00-91-272-833-148

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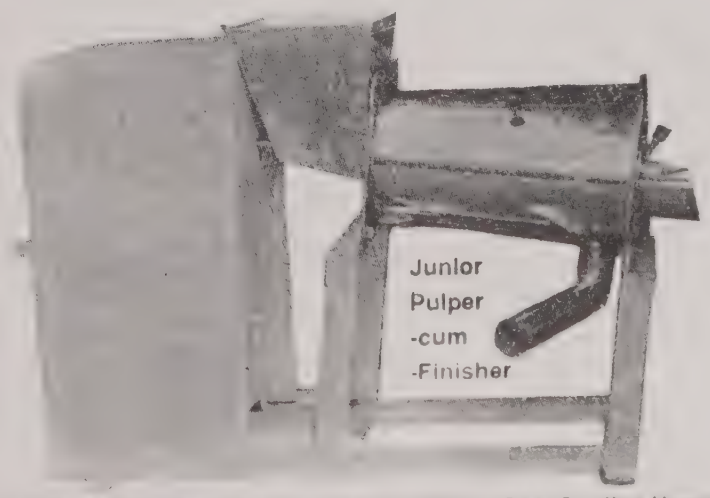
● PINEAPPLE SLICING MACHINE ● JUICE EXTRACTORS ● FRUIT AND VEGETABLE CRUSHER
● CANNING RETORT ● BOTTLE WASHING M/C. ● EXHAUST BOX ● BOTTLE FILLING M/C.



Steam Jacket Pan

Ashirwad Complex, Gala No. 2, Vashi Village, Opp. Starling Hospital, New Bombay 400 703. Tel: (022) 7667069, 7662098

See under "Boilers".

Kalpana Boilers & Chemical Plants Mfg. Co. -- See under "Boilers".

OIL SEEDS CLEANING AND GRADING MACHINERY

Forsberg Agritech (India) Pvt. Ltd. -- See under "Grains & Cereals Cleaning / Grading Machinery".

OLEORESINS

Bhagat Impex Pvt. Ltd., 164, Sitaram Poddar Marg, Bombay 400 002. Tel: 316928/29/95 Tlx: 011-85356.

L. B. Aroma Chemicals -- See under "Essential Oils".

ORANGE OIL

Balaji Dye Chem -- See under "Acids".

Sesu Trading Corp. -- See under "Acids".

OVENS, BISCUIT & BAKING

Admir Engineers -- See under "Bakery/Biscuit Equipment."

Aifso Enterprises, A/1, Veena Beena Apts., Sewri (W), Bombay 400015 Tel. Off: 4137339/4130926 Res: 4137109/4134568 Fax: 91-22-4137339.

Continental Equipment (India) Pvt. Ltd., -- See under "Bakery / Biscuit Equipment".

Grovers Pvt. Ltd. -- See under "Bakery / Biscuit Equipment".

OVENS/ TRAY DRYERS

(See also "Dryers, Ovens/ Tray, etc.,)

Ami Industries, 8, Surve Indl. Estate, 1st Sonawala Cross Rd., Goregaon (E), Bombay 400 063. Tel: 8734753/8727120.

Continental Equipment India Pvt. Ltd. -- See under "Bakery/ Biscuit Equipment"

Ece Cee & Company -- See under "Filling & Sealing Machines".

Flora Engineering Co. -- See under "Fluid Bed Dryers".

Frigmaires Engineers -- See under "Agitators".

Kailash Scientific Co., 28, Universal Ind'l Estate, I. B. Patel Road, Goregaon (E), Bombay 400 063. Tel: 8734735/8731836.

Manikant Bros. -- See under "Anti-Corrosion Chemicals".

Sakav Enterprises -- See under "Air Driers".

Thermal Instruments & Equipments, 2-1-478 Nallakunta University Road, Hyderabad 500044. Tel: 41720.

PACKAGING FILM

Plastic International -- See under "Packaging Material".

PACKING MACHINERY

Ebrahimjee Essabhai & Sons, 11 Old Hanuman Lane, Princess St., Bombay 400002. Tel: 2011694.

Pretty Packwell Pvt. Ltd., 173 Parekh Nagar, S. V. Rd., Kandivali (W), Bombay 400 067. Tel : 8050934 / 8055904.

Rishabh Automation, Rishabh, 28/10 Kothrud, Near Tejas Society, Pune 411029. Tel : 369693. Fax : (91) 212-662210.

Selall, 'Geetanjali' 9 Deccan College Road Pune 411006. Tel : 668369.

PACKAGING MATERIAL

Boxboard Industries, J/17, MIDC Bhosari, Pune 411 026. Tel : (0212) 790313 / 792286.

Central India Packaging Co. (P) Ltd. and Allied Companies, 3-6-140, Liberty Road, Himayath Nagar, Hyderabad 500029. Tel : 236645 / 230045, 233345, Tlx : 425-2257, Fax : 0842-233345.

Compack Systems, E-211, Flatted Factory Complex, Okhla Indl. Area, Phase III, New Delhi 110020. Tel : 634065 / 6831545.

Fine Plast Industries Pvt. Ltd., Sarang Street, Taher Bldg, 1st Flr., Bombay 400 003. Tel: 329303/ 345075. Grams: POLUDRUMS. Telex: 011-83818 NPAI IN.

Gansons Engineers Pvt. Ltd., 118-121, Swastik Chambers, Off Sion-Trombay Road, Chembur, Bombay 400 071. Tel: 524548/ 524967. Tlx: 011-72388. Grams: INMAGANSON.

Indu Packagings Pvt. Ltd., Meenakshi, S. V. Road, Vile Parle (W), Bombay 400 056. Tel: 6367645 / 6367762.

Jayna Packaging Pvt. Ltd., Jayant House, Bail Bazar, Kurla-Andheri Rd., Bombay 400 070. Tel: 5144038.

Maxxon India Limited, 12th Flr., Devika Tower, 6, Nehru Place, New Delhi-110019. Tel : 6445513. Tlx : 03162505 MAX IN.

Moss Plastics & Films Pvt. Ltd., W-42(H), MIDC, Ambad, Nashik 422 010. Tel:2841/2842.

Package India, No. 4A (K.G.) Street, Mathiazhakan Nagar, Padi, Madras 600050. Tel : 6257260.

Plastic International, B/13, Nanddham Indl. Estate, Marol, Andheri (E), Bombay 400 059. Tel: 8320798/8322683 Tlx: 11-79498 Gr: Interplast Fax: (011) 8366237.

Propack Industries -- See under "Films, Multilayer".

PACKAGING TAPES

Polypak Products -- See under "Adhesives/Adhesive Tapes".

PALLET HANDLING SYSTEM

Mac Industrial Systems -- See under "Material Handling System".

PAPAIN
(Anti Turbidity Agent)

Enzo-Chem Laboratories Pvt. Ltd., 'Kailas', 3rd Floor, 320, Sir Bhalchandra Road, Matunga (E), Bombay 400 019.

Karnataka Dehydrates Ltd., 42 Indl. Suburb, II Stage, Goruguntapalya, Opp FTI, Bangalore 560022.

PARAFFIN WAX

Balaji Dye Chem -- See under "Acids".

PARBOILING PLANTS

Agro Engineering Products. (Delhi) P. Ltd. 38, South Extn. Part I, New Delhi 110049. Tel : 698928, 617928.

PASTEURIZERS

MF Marketing Pvt. Ltd., B-15, Arjun Centre, B. S. Devshi Marg, Govandi, Bombay 400088. Tel : 5557515/5560947 Tlx : MF IN 76502 Fax : 91-22-5560569.

PASTE & LIQUID FILLING MACHINE

United Technologie -- See under "Conveyor".

PECTIN

Amit Fine Chem. -- See under "Agar-Agar (Powder/Strips)".

Balaji Dye Chem -- See under "Acids".

B. I. Mehta -- See under "Acids".

Kapadia Gumchem Industries -- See under "Guar Gum"

Manak Citrus Products Pvt. Ltd. -- See under "Essential Oils".

Olin Chemicals -- See under "Acetic Acid".

Parul Enterprises -- See under "Agar Agar (Powder/Strips)".

Pecti-Chem Industries, D-47 MIDC, Jalgaon 425003. Tel: 0257 - 25510 / 28635.

Sesu Trading Corporation -- See under "Acids".

Southern Citrus Products (P) Ltd. Gudur 524101, Nellore Dist., A.P. Tel. : 213 28/215 28

PET BOTTLES

Technology Plastics Limited, 10 Haddows Road, Nungambakkap, Madras 600 006. Tel : 5222701/ 5229792 Fax : (44) 834728

PICKLE CUTTING & SLICING MACHINE

Liston Laghu Udyog, Hirabhai Compound, Plot No. 11, Gala No.3, Ghorapdeo, 1st Cross Lane, Reay Road, Bombay 400 010. Tel: Off: 588579. Fact.: 8723021/8513224.

Raj Products & Equipments -- See under "Vermicelli Machine".

PILFER PROOF CAP MAKING MACHINES

Advance Packaging -- See under "Bottle Closure Machinery".

PILLOWPACK PACKING MACHINES

New Indo International -- See undr "Food Processing Equipment/Plants.

Production Engineering Consultants, 206, Aakaar Kalyan Complex, Yari Rd., Versova, Bombay 400 061. Tel : 6290161, 6271021.

PILLOWPACK POUCHES

Trend Pack, 4, Arvind Comml. Bldg., 1st Floor, Sun Mill Compound, Lower Parel, Bombay 400013. Tel : 494 6680/81 ; Fax : 91-22-4933807

PLANETARY MIXER

Cosywo Engineering Company -- See under "Chemical Plant & Equipment".

Fabdecon Engineers -- See under "Agitators".

Sigma Engg. Ind. Pvt. Ltd., Unit No. 112, Sun Industrial Estate, Sun Mill Compound, Lower Parel, Bombay 400013. Tel: 4927801.

United Technologie -- See under "Conveyor".

PLASTIC ROLLS, PRINTED

Shreeji Polylaminates Pvt. Ltd. -- See under "Laminated Pouches"

PLATINUMWARE

Lab Instrument -- See under "Heating Mantles".

PNEUMATIC CONVEYING SYSTEMS

Indcon Polymech Ltd. -- See under "Air Blowers".

PNEUMATIC CRUSH KNIFE HOLDER

Liston Laghu Udyog -- See under "Pickle Cutting & Slicing Machine".

POLYCANS, HM-HDPE

Time Packaging Ltd., 604 Vishwananak, ICT Link Rd., Chakala Andheri (E), Bombay 400 099. Tel : 8361278/8376664 Fax : 91-22-8376663

POLYETHYLENE COATED PAPER

Guardian Plasticote Limited, 12, HOCHI MINH Sarani, Calcutta 700071. Tel : 242-7676/242-9914/242-4795, 242-7675. Tlx : 21-7459 GARD IN. Fax : 91-33-242 2088.

POLYETHELENE FILM

Ureka Polymer (P) Ltd., 243/B/1, Najaf Garh, New Delhi 110043. Tel : 89-54337/89-50792/89-26011. Fax : 110-89-55493.

POTASSIUM META BI SULPHITE

Allied Chemical Corpn., R1/300, Raopura Rd., P. B. 280, Baroda 390 001 Tel: 51843 / 50969

Balaji Dye Chem -- See under "Acids".

Sesu Trading Corp. -- See under "Acids".

POTATO STARCH

KMC-Narayan, C/o. Narayan & Co., Mangalam Building, Kankuwadi, P. M. Road, Vile Parle (E), Bombay-400 057. Tel. : 614 5952/6148226 Fax : 6101243.

POUCH FILLING MACHINES

H. R. (Paper) Machinery Pvt. Ltd., 116 Acharya Commercial Centre, Near Basant Cinema, Chembur, Bombay 400 074. Tel : 5519723/5551452 Tlx : 011-71036 SUPR IN

Indec Equipment Pvt. Ltd. -- See under "Aseptic Packaging".

Unique Flexo Packaging -- See under "Automatic Form-Fill-Seal Machines".

POUCH MAKING MACHINES

Chinoy Electronics, 112 Akshay Industrial Complex, Ghole Patil Road, Pune 411001 Tel : 663698/663885

Eee Cee & Co. -- See under "Filling & Sealing Machines".

Indec Equipment Pvt. Ltd. -- See under "Aseptic Packaging"

Subash Gupta & Co -- See under "Heating Elements"

POUCHES

Shreeji Polylaminates Pvt. Ltd., -- See under "Laminated Pouches"

POWDER/PASTE BLENDERS

Mamko Process Equipments Manufacturers -- See under "Emulsifiers".

POWDER FILLING MACHINE

Frigmaires Engineers -- See under "Agitators".

PP BOX STRAPPING MACHINE

Ultra Enterprises -- See under "Machinery, Packaging".

PRESSURE GAUGES

Girja Engineering Works, Patel Estate, Sonawala Road, Opp. Cisco Factory, Goregaon (East), Bombay 400 063. Tel : 694 976.

Goma Engineering Pvt. Ltd., B-9, Kayteeco Ind. Estate, Behind Paper Products, Majiwada, Thane 400 601. Tel: 501424/591514.

PROCESS PLANT EQUIPMENT

Gopinath Engg. Co., 4 Ruchi, 36 Swastik Society, Navrangpura, Ahmedabad 380009. Tel : 409183/425456. Fax : 0272-42545.

Mamko Process Equipments Manufacturers -- See under "Emulsifiers".

Neotech Equipment -- See under "Steam Boilers".

P. J. Electronics, 46 Dr. Ambedkar Rd., Sangam, Pune 410001. Tel : 667710.

Ross Enterprises, No. 6 New Era Society, Salisbury Park, Pune 411 037. Tel: 652210.

PROPYLENE GLYCOL

Olin Chemicals -- See under "Acetic Acid".

PULPER

Geeta Food Engineering -- See under "Food Processing Equipment/Plant".

PULVERISERS

D. P. Pulveriser Works, Modi & Modi Bldg., 76, Nagindas Master Road Extn., Opp. Maharashtra State Co-op. Bank Ltd., Fort, Bombay 400 023. Tel: 276435/274901 Grams : GRANULE

Frigmaires Engineers -- See under "Agitators".

Kaps Engineers -- See under "Grinding Mills".

Sesa Pulverisers -- See under "Grinder, Wet & Dry".

United Technologie -- See under "Conveyor".

PUMPS

Beer, Carbonator, Centrifugal, Rotary, Vacuum etc.

Acmevac Sales Pvt. Ltd. -- See under "Bottle Washers & Rinsers".

Elmach Engineering Co., 410, Hill View Co-op. Ind. Estate, Off L.B.S. Marg, Ghatkopar (W), Bombay 400 086. Tel: 270160/272760.

Flocon Equipments, C 11/7 Bonanza Indl. Estate, Ashok Chakravati Rd., Kandivli (E), Bombay 400 101. Tel : 8892017 / 8823055.

Jagdish Engineering Works. 7/2, Rocky Industrial Estate, I. B. Patel Road, Goregaon (E), Bombay 400 063. Tel: 8731134.

SSP Pvt. Ltd. -- See under "Evaporators"

Technomech Pumps, Bombay Wire Compound, Gala No. 10, I. B. Patel Rd., Goregaon (E), Bombay 400 063.

QUALITY CONTROL INSTRUMENTS

J. M. Parekh, 11 M. G. Rd., Red Cross House, 1st fl., Behind Canara Bank, Pune 411001. Tel : 640663 / 658245. Tlx : 643679 / 643688.

REACTORS

Fabdecon Engineers -- See under "Agitators".

REFRIGERATION EQUIPMENT / PLANT

Airtech Engineers, B-93 Ph II, Okhla Indl. Area, New Delhi.

Continental Equipment India Pvt. Ltd. -- See under "Bakery/Biscuit Equipment".

General Airconditioning Company -- See under "Walk in Cooler".

Hindustan Refrigeration Industries, 2 & 4, Netaji Subhas Marg, Darya Ganj, New Delhi 110002. Tel : 3271898/3277725/3277735/3271152. Fax : 011-3271152.

'Metacolor', Shree Precoated Steel Ltd., Hanuman Bldg., 308 Perin Nariman Street, Behind RBI, Fort, Bombay 400001. Tel : 2662540/2661232. Tlx : 011-82793 YOGI IN Gram: AJMERABILD. Fax : 91-22-266 1878.

National Refrigeration Works, 2 & 3, Subhash Marg, Darya Ganj, New Delhi 110002. Tel : 3274041/3274042/3271252. Grams : KOOLING Fax : 011-3270740.

Refrigerators & Home Appliances (P) Ltd., 158, Anna Salai, Madras 600 002. Tel: 868 717 / 867286 Gram : URI GOLD

Transair -- See under "Airconditioning / Refrigeration Plant & Equipment".

RENNET

Olin Chemicals -- See under "Acetic Acid".

RIBBON MILL

Fabdecon Engineers -- See under "Agitators".

United Technologie -- See under "Conveyor".

RICE MILL MACHINERY

Dev Raj & Company, Bazar Krishan Sudama, Firozpur City 152002. Tel : 2468 / 3648. Grams : RICEPLANT.

ROLLED SUGAR CONE MACHINERY

R & D Engineers -- See under "Icecream Cone Machinery".

ROLLER FLOUR MILLS

Akay Industries, 39/7 Bawang Road, Sammepur, P. O. Badli, Delhi 110 042. Tel : 7292819 / 6437929.

SEALING MACHINES, LUG CAP

Raj Products & Equipment, P. O. Box 8075, Bombay 400 056. Tel: 8192750 Fax: 8375628.

SEALING MACHINES

Dedhia Engineering Corpora-

tion, Dedhia Enterprises, 129/130, Shanti Indl. Est. Sarojini Naidu Rd, Mulund (W), Bombay 400 080.

Ece Cee & Co. -- See under "Fillling & Sealing Machines".

H. S. Enterprises, G-17 Meghal Service, Indl. Estate, Devidayal Rd., Mulund (W), Bombay 400 080. Tel. : 5616112.

Novel Engineers Pvt. Ltd., Post Box 9224, Shop No.5, Bldg. No. 6A, Damodar Park, L.B.S. Marg, Ghatkopar (W), Bombay 400 086. Tel: 514 3926/578 5239.

Protech Engineers (India), 884/ 3 & 4, GIDC Estate, Makarpura, Vadodara 390010. Tel : 441478.

Providence Corp., 23/4 Resthouse Crescent, Bangalore 560001. Tel : 5587619.

Sealers India, B-15, Annexe, Mugappair Industrial Estate (West), Behind Wavin India, Madras 600050. Tel : 656283/655203. Tlx : 24060 PCO-IN-WDT-015.

Swastik Packaging, 4, Dev Sadan, Ground Flr., Chimatpada, Marol Naka, Andheri (E), Bombay 400 059. Tel: 8324673/8341340.

Ultra Enterprises -- See under "Machinery, Packaging".

SEAMING MACHINES

Ganga Singh Sukhwinder Singh & Sons -- See under "Canning Machinery & Plants".

SEED CLEANING MACHINERY

Forsberg Agritech (India) Pvt. Ltd. -- See under "Grains & Cereals Cleaning / Grading Machinery".

Goldin (India) Equipment Pvt. Ltd. -- See under "Cleaning / Grading Machinery".

SELF ADHESIVE TAPES

Maharshi Udyog, 4 Ruchi, 36, Swastik Society, Navrangpura, Ahmedabad 380009. Tel : 409183, 425456. Tlx : 0121-6369 GOPI IN. Fax : 0272-425456.

SEPARATION MACHINERY

Forsberg Agritech (I) Pvt. Ltd. -- See under "Grains & Cereals Cleaning / Grading Machinery".

Goldin (India) Equipment Pvt. Ltd. -- See under "Cleaning / Grading Machinery".

Westfalia Separator India Pvt. Ltd. -- See under "Machinery, Food & Beverage Processing".

SHRINK FILM

Indee Equipment Pvt. Ltd. -- See under "Aseptic Packaging"

Plastic International, B/13 Nanddham Indl. Estate, Marol Andheri (E), Bombay 400 059. Tel: 8320798, 8322683 Tlx: 011-79498 SKON IN Gram : INTERPLAST.

Propack Industries, Sona Udyog, Bldg. No.4, 2nd Floor, Parsi Panchayat Road, Andheri (East), Bombay 400 069. Tel : 8325364/ 8325837 Tlx: 11-79171 - VKEPIN. Fax: 6366384.

SHRINK WRAPPING MACHINES

Aarkey Industries -- See under "Machinery, Packaging".

Providence Corp. -- See under "Sealing Machines".

Sevana Electrical Appliances Pvt. Ltd., P.B. No.2 Kizhakkambalam 683 562 Kerala. Tel : 048548-302 Tlx : 0882-227 SEAL IN

Ultra Enterprises -- See under "Machinery, Packaging".

SIFTERS

Ami Associates & Consultants Pvt. Ltd., 13, Manoj Indl. Estate, 40-A, Katrak Rd., Wadala, Bombay 400031. Tel: 4133262/4129233 Fax: 022-413-5638 AC - DR-44. Tlx: 011-76330 AMI IN.

United Technologie -- See under "Conveyor".

SILO STORAGE SYSTEMS

Shirke Structurals Pvt. Ltd., Agro Division, 72-76 Mundhwa, Pune 411036. Tel : 670151 / 670232. Tlx : 0145-7280 BGSP IN.

SIZE REDUCTION EQUIPMENT

Frigmaires Engineers -- See under "Agitators".

Kaps Engineers, 831, GIDC, Makarpura, Vadodara 390 010. Telex : 0175 - 533 MICON IN.

SLICING & CUTTING MACHINES

Ece Cee & Company -- See under "Filling & Sealing Machines".

Liston Laghu Udyog -- See under "Pickle Cutting & Slicing Machine".

SMOKE GENERATOR

Ultima Search, Excel Estate, S. V. Rd., Goregaon (W), Bombay 400 062. Tel : 8722711.

SODIUM ALGINATE

Balaji Dye Chem -- See under "Acids".

Burzin & Leons Agenturen Pvt. Ltd., -- See under "Additives, Food & Beverage".

Olin Chemicals -- See under "Acetic Acid"

Sesu Trading Corp. -- See under "Acids"

Snap Natural & Alginate Products Ltd., Plot No. 1, Sipcot Industrial Complex, Ranipat 632 403.

SODIUM BENZOATE

Alok Chem Corporation -- See under "Cream of Tartar".

Balaji Dye Chem -- See under "Acids".

Ganesh Benzoplast Ltd. -- See under "Additives, Food & Beverage".

Olin Chemicals -- See under "Acetic Acid".

Sesu Trading Corp. -- See under "Acids".

SODIUM CITRATE

Olin Chemicals -- See under "Acetic Acid"

SOFT DRINK PLANTS

Hitech Ultraviolet Pvt. Ltd. -- See under "Dairy Plant & Equipment".

SOFTDRINK CONCERTRATES

Feroze Foods & Flavours -- See under "Essences & Flavours".

SOFTENERS

Soft-Dion Water -- See under "Demineralizers".

SORTING MACHINE

Impetus Incorporated, K. 56/4 Sri Krishna Apts., Annanagar, Madras 600102. Tel : 626946. Tlx : 41-6974 PCO IN.

SOYA FOOD PLANTS

Forsberg Agritech (India) Pvt. Ltd. -- See under "Grains & Cereals Cleaning / Grading Machinery".

Indovita Protein Pvt. Ltd., S-1, Bulandshahr Road, Industrial Area, Ghaziabad 201 001.

SOYA LECITHIN

Balaji Dye Chem -- See under "Acids".

Olin Chemicals -- See under "Acetic Acid"

Sesu Trading Corporation -- See under "Acids".

SPECTROPHOTO METERS

Lab Instruments -- See under "Heating Mantles".

SPICES CLEANING/ GRADING MACHINERY

Forsberg Agritech (India) Pvt. Ltd. -- See under "Grains & Cereals Cleaning/Grading Machinery".

Goldin (India) Equipment Pvt. Ltd. -- See under "Cleaning / Grading Machinery".

SPICES PLANT

Sifter India Food Processing Machineries Pvt. Ltd., Plot No. 227, Sector 24, Faridabad 121 005. Tel : 8242586 / 8242597. Gram : SIFTER.

STANDI POUCH MACHINERY

Crystal Engineering Co. India -- See under "Filling & Sealing Machines".

STARCH

KMC-Narayan -- See under "Potato Starch".

STEAM JACKET KETLE

Geeta Food Engineering -- See under "Food Processing Equipment / Plant".

STERILIZERS

M. F. Marketing Pvt. Ltd. -- See under "Pasteurizers".

STIRRERS

Cosywo Engineering Co. -- See under "Chemical Plants & Equipment".

Fabdecon Engineers — See under "Agitators".

Frigmaires Engineers -- See under "Agitators".

United Technologie -- See under "Conveyor".

SUNFLOWER DEHULLING PLANT

Goldin (India) Equipment Pvt. Ltd. -- See under " Cleaning/Grading Machinery".

TANK CLEANING MACHINES / NOZZLES

Siddharth Enterprises, Narendra Estate, Opp. Kamgar Stadium, S. B. Marg, Dadar, Bombay 400 028. Tel: 4223288, 4224888 Tlx: 011-71256 Fax : 91 -22-4370388

TAPES, PACKAGING

Kalhans Packaging Ltd., 6,

Model House, 158, Sion (E), Bombay 400022. Tel: 4077276/4077905 Tlx: 011-71606 KPPL IN.

TARTARIC ACID

Balaji Dye Chem — See under "Acids".

Olin Chemicals -- See under "Acetic Acid".

Sesu Trading Corp. -- See under "Acids".

Thirumalai Chemicals Limited — See under "Acids".

TEMPERATURE INDICATOR

Sakav Enterprises — See under "Air Driers".

THERMIC BOILER

Kalpana Boiler & Chemical Plants Mfg. Co. — See under "Boilers".

THERMIC FLUID HEATERS

Ross Enterprises — See under "Boilers".

THERMOFORMING MACHINES

Elmach Packages (India) Pvt. Ltd., 410 Hill View Co-Op Indl. Estate, Off. LBS Marg, Ghatkopar (W), Bombay 400 086 Tel: 5171071, 5171684. Gram: 'BLISTERPAC'.

Pakona Engineers (India) Pvt. Ltd. -- See under "Machinery, Packaging ".

Plasto Pack -- See under "Bag Closers".

THERMOFORMED CONTAINERS

Circle KS Polyset Industries Pvt. Ltd. -- See under "Containers & Caps, Disposable".

TIN CONTAINERS

Swastik Industries, 34/C Thakkar Bldg., Gr. Floor, Gala No-4, Champsi Bhimji Road, Old Anjirwadi, Mazgaon, Bombay 400010.

TINPLATE ELECTROLYTE

Indian Tinplate Manufacturers, 721, Indira Prakash, 7th Flr., 21, Barakhamba Rd., New Delhi 110 001. Tel: 3712665.

TRANSPORT REFRIGERATION

General Airconditioning Co. -- See under "Walk-in Cooler".

Transair -- See under "Airconditioning/Refrigeration Plant & Equipment".

TRAVELLING OVENS

Admir Engineers, Plot No. 1E/4, Shivaji Nagar, Govandi, Bombay-400 043. Tel. : 556 8446/551 1718/5518182

TRAY DRYERS

Ami Industries -- See under "Ovens / Tray Dryers".

Kailash Scientific Co. -- See under "Dryers, Oven / Tray, etc.".

Sakav Enterprises -- See under "Air Driers".

TURNKEY PLANTS

Fabdecon Engineers -- See under "Agitators".

U.V. WATER DISINFECTANT SYSTEM

Hitech Ultraviolet Pvt. Ltd., P. B. No. 8356, C/14 Grace Plaza, S, V. Rd., Jogeshwari (W), Bombay 400 0102. Tel: 6286845/6282517/6244574/6244576 Fax: 6206702.

U.V.Tech Systems Pvt. Ltd., 160/3, Rajani House, Opp. Don Bosco High School, L.T. Rd., Borivali (W), Bombay 400 091. Tel. : 8013601/8016981 Gr : ULTRASAFE. Tlx : 011-70151 SAFE IN.

ULTRAFILTERATION SYSTEM

Memsep -- See under "Water Distillation Plants".

VACUUM EJECTORS

SSP Pvt. Ltd. -- See under "Evaporators".

VALVES

B. D. K. Marketing Services Pvt. Ltd., 47/48 Gokul Rd., Hubli 580030. Gram: UNIFLOVAL. Tlx: 0865-315 Bombay Office Fax : 022-494-8584.

Flocon Equipments -- See under "Pumps".

Servex Engineering Industries Pvt. Ltd., S.P.S. Industrial Estate No.2, Unit No.17, L.B.S. Marg, Bhandup, Bombay 400 078. Tel. : 5600874/5613348/5618839.

VANILLIN

Amit Fine Chem. -- See under "Agar Agar (Powder/Strips)".

Kapadia Gumchem Industries -- See under "Guar Gum".

Olin Chemicals -- See under "Acetic Acid".

Parul Enterprises -- See under "Agar-Agar (Powder/Strips)".

VERMICELLI MACHINE

Raj Products & Equipments, P. O. Box No. 8075, 397, S. V. Road, Vile Parle (West), Bombay 400 056. Tel : 6147622 / 6102035. Fax : 91-22-8375628.

VITAMIN PREMIXES

Roche Products Ltd., A Piramil Enterprise, 28 PT. M. M. Malaviya Road, Bombay 400 034 Tel : 484 5890 Grams : HOFROCHE Tlx : 75169.

VOLUMETRIC LIQUID FILLERS

For-Bro Engineers, 10 Ashok Indl. Estate, Plot No. 6, Udyog Nagar, Goregaon (W), Bombay 400062. Tel: 697761.

Metadic Engg. Pvt. Ltd., Unit No. 2, Vijay Industrial Estate, I. B. Patel Road, Goregaon (E), Bombay 400 063. Tel: 8735719/8730821.

The Master Mechanical Works Pvt. Ltd. — See under "Bottling Plants".

WALK IN COOLERS

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WATER DISTILLATION PLANTS

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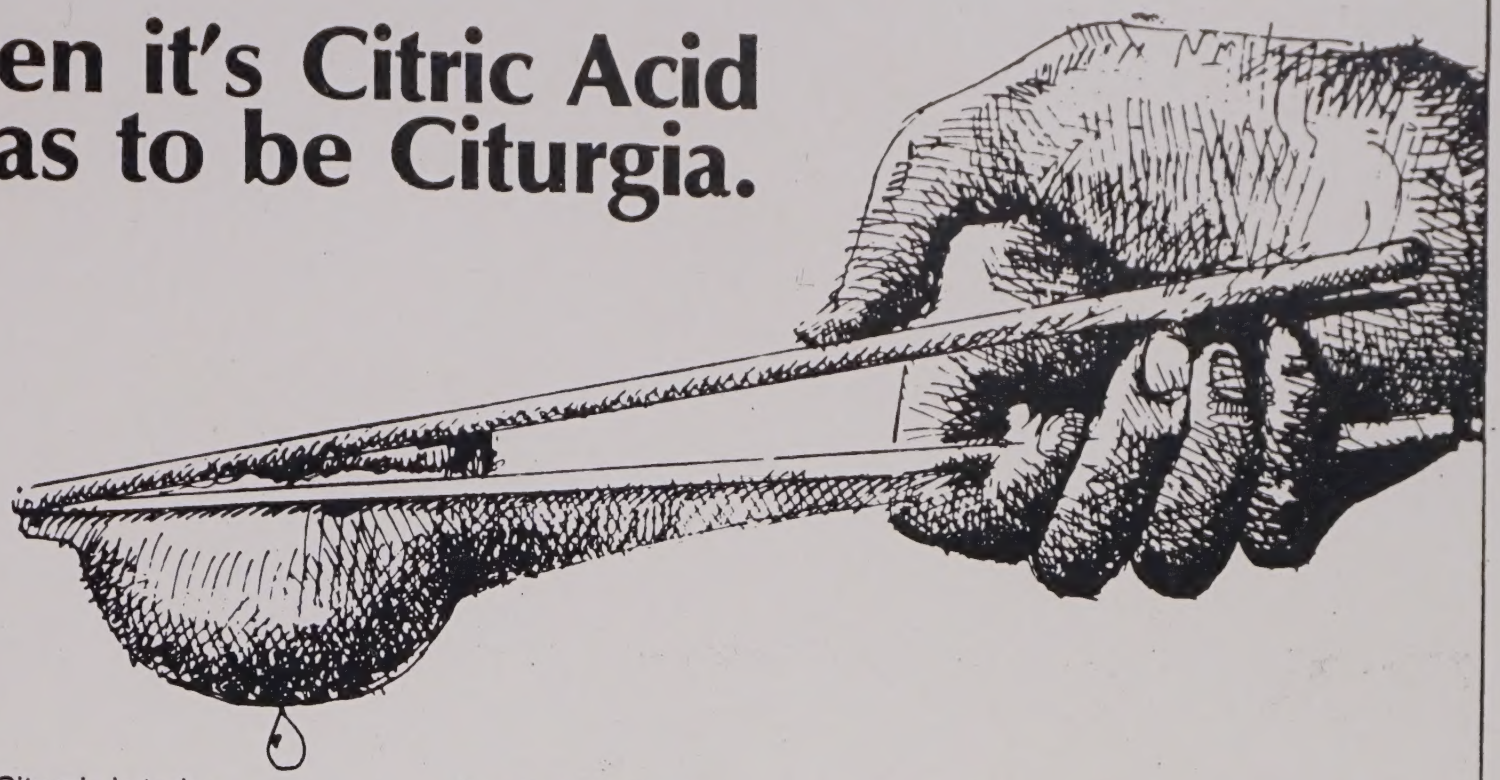

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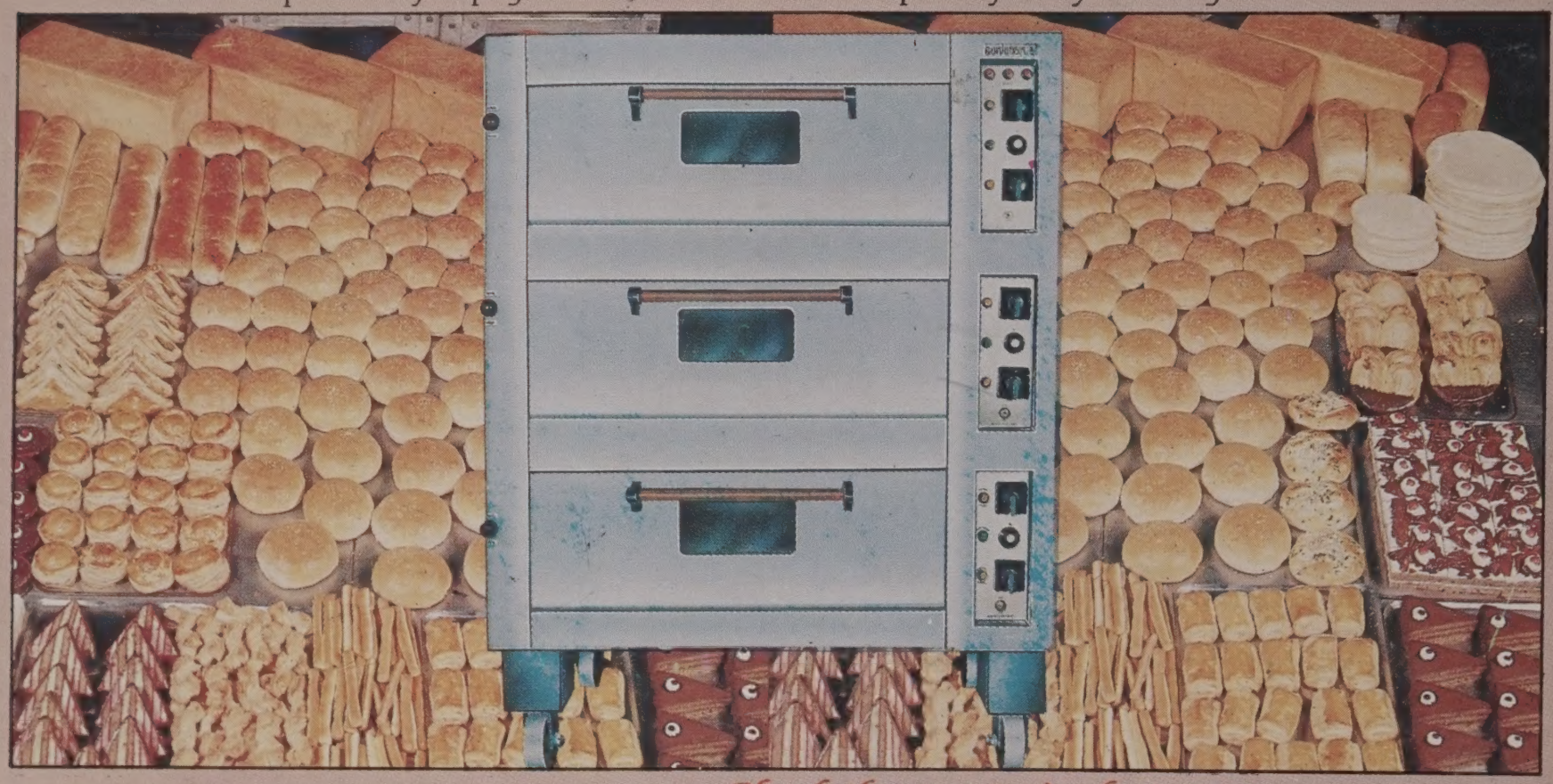

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